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FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

J. E. TAYLOR, PH.D., F.L.S., F.G.S., F.R.G.S.I., &c.

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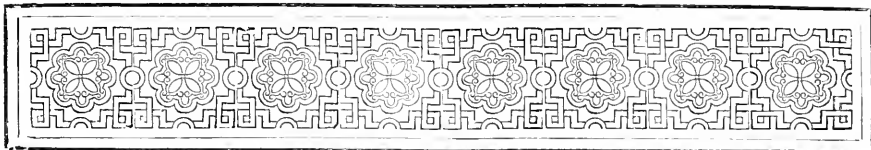
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PREFACE.



—o—o—o—

FIFTEEN years is a long period in the life of a man, and a relatively longer one in the existence of a magazine. It is time enough to have given a fair trial to any scheme, or to have proved a *raison d'être* for any institution. We are reminded of this in prefacing a few lines to the Fifteenth Volume of SCIENCE-GOSSIP. And it is with no small pleasure, as we take a mental review of our situation, that we find ourselves surrounded with more numerous friends, and even abler contributors than ever.

The domain of Natural Science extends in widening circles every year. New and more complex organic relationships are discovered the more we look for them. We bear the highest of unconscious testimony to the Supreme Intelligence which governs the universe, when we require the facts of Science to be subordinated to intelligible laws; and there is a higher mental pleasure in finding out the laws which govern these facts, than in discovering the facts themselves. But as the circle of the Known increases in its circumference, we perceive the larger periphery of the Unknown which circumscribes it. Within this infinitely little circle, there is light as in the land of Goshen, but outside, darkness like that of Egypt! The attitude of the scientific mind, therefore, ought more than ever to be the reverse of dictatorial.

During the past year we have opened our columns to the discussion of one of the most interesting of the many biological side-paths

PREFACE.

which modern investigation has opened out, the question of "Intelligence in Man and Animals." We have been pleased with the ability with which the subject has been discussed from the evolutionary, as well as the anti-evolutional sides, and not less so with the good temper and courtesy displayed by the partisans. Twenty years ago this mutual forbearance would have been impossible, and a discussion like this would have broken up into personal recriminations. We must now, however, close the debate.

The crowded state of our "Exchange" columns shows how zealously amateurs are working in their special departments of natural history; and the various and oftentimes queer questions put to us in the columns devoted to that purpose, indicate the number of recruits who are joining the ranks. We hope that the "List of Naturalists" which appears in the present number will prove of great practical advantage to young and ardent workers.

We look forward to a more active year than ever. Our editorial box is well filled with articles—technical, descriptive, and popular, on every branch of Natural Science. We shall do our best to make the volume for 1880 more attractive in every way than any of its predecessors. And, whilst thanking our numerous, zealous, and hearty friends for the many kindnesses we have received at their hands, we wish to all our contributors and subscribers, "A HAPPY NEW YEAR!"

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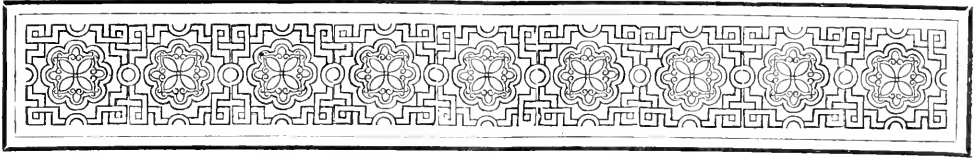
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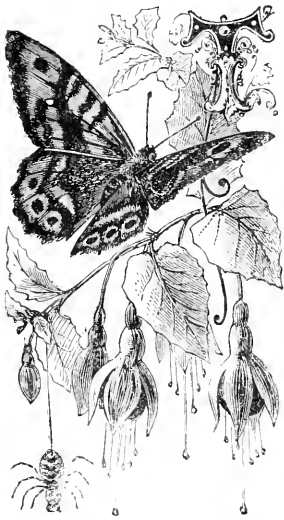
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THE CAPPED CUMULUS, OR ARCHED CROWN.

BY THE REV. S. BARBER, F.M.S.



THIS phenomenon, which is not very unusual in thundery weather, when the storm is gathering or passing away, is interesting as being indicative of the extent to which the electrical masses affect the contiguous atmosphere. When highly charged piles of cumulus are seen drifting in the breeze, at no great distance, and exhibiting rifts and chasms and mountain crags about their precipi-

tous sides and sunny peaks,—wreaths of mist and vapoury bands may be seen floating athwart the dark sides and rolling upwards toward their summits. This foggy vapour holds off from the rock-like sides of the towering cumulus (with which it refuses to coalesce), and gives to the latter an appearance of great solidity. Often maintaining its isolation, it spreads over the topmost crests in a thin, loose strip of vapour, and, bending down the opposite side of the cloud, forms a complete *detached* arch. At times this arch has the appearance of being highly condensed; and, allowing for the height of the species of cumulus to which it attaches itself, the intervening space of clear sky between the two clouds must often be of considerable dimensions.

There can be little doubt that the cap or arch formed in this way has a form which corresponds to that of the larger cloud. At times, however, the appearance may be one of perspective only, as may be seen when there are short strips or thin lines of

condensed stratus lying among the cumulus. These, particularly in unsettled weather, have their ends sometimes *bent downwards*, as if attracted by the earth.* In passing, we may say that this latter form of cloud (which is closely allied to the cumulus—"cap") is seen generally before rain storms, and often precedes violent squalls. It is seen occasionally in parallel bands.

Whether the form of the vapour which crowns the summit of a cloud-pile results from the radiation of electrical force acting at a certain distance, or is merely the effect of condensation caused by the chilling effect of the cloud mass on the surrounding air, is an interesting though a difficult matter to determine; the relations existing between different masses of cloud not having yet much engaged the attention of meteorologists. Even when these masses are similar in species there is much difficulty; but the difficulty is greater when those species are different, *e.g.*, those of stratus and cumulus, as in our present subject.

It has been remarked by Maury and other writers, that the sudden formation of hail or snow must often be attended by a noticeable increase in the temperature of the surrounding atmosphere, and the fact has been so recorded. This increase of temperature is in agreement with, and indeed corroborates, the mechanical theory of heat so fully enunciated by Tyndall in his interesting work on "Heat as a Mode of Motion." The part which electricity plays in regard to the origin of the stifling and oppressive† atmosphere that precedes thunderstorms must be very powerful, whether acting directly or indirectly.

It has been noticed that the passage of a large bank of cirro-cumulus will often cause a remarkable dropping of the temperature of the air beneath; and (allowing this to be true) we can only account for the

* Probably it is merely a more condensed variety of that which forms our present subject.

† There can be little doubt, however, that the sensations many persons experience before a storm result from the direct action of the electricity in the body.

fact by supposing that the particles of the cloud are in the transition state—changing rapidly from the condition of half-frozen water into the vaporous state of cumulus or nimbus. We say *half* frozen, for the cirro-cumulus scarcely ever exhibits, like the various forms of cirrus, prismatic effects, which it undoubtedly would do if it were composed of fully formed ice-crystals. If then, we allow the accuracy of the observations recorded, as to the chilling effect of this cloud on the atmosphere beneath, we may also be justified in inferring that, for the most part, it is *a transition cloud between cirrus* (the proper ice-cloud) *and some other more watery species, e.g., cumulus or stratus*, rather than an intermediate stage between these and the cirrus itself.

(To be continued.)

A RAMBLE ON THE KENTISH HILLS.

I THOUGHT that an account of some of the spring plants to be found on the hills near Otford and Kemsing might be interesting to the readers of SCIENCE-GOSSIP who had never botanised in this locality. My first intention was to call this article "A Walk on the Chalk," but thinking the title might mislead, I changed it—"A Walk on the Chalk" generally being considered in London "a milk walk!"

Three of us started from Otford platform—it can scarcely bear the dignified title of station—at about eleven o'clock in the morning, walked through the village, admired the old castle (where, by the bye, a blacksmith has erected a smithy), and then through a gate, over a ploughed field, up the hill; what with the hill and the field, it rather tired us, it being extremely warm. Halfway up, on a grassy bank, we espied *Ophrys muscifera* and *Aceras anthropophora*; a little higher up two or three clumps of *Cynoglossum officinale*; on the brow, under the trees, we passed *Daphne Laureola* and *Atropa Belladonna*, both in profusion; then we caught sight of a fine spike of *Orchis fusca*, which amply repaid our blow up the hill. A short distance on we found *Neottia Nidus-Avis*, its brown stalk and flowers exactly matching the colour of the ground. Down the hill again more *fusca*, then a large specimen of *Habenaria chlorantha*, measuring about 28 inches in height, and a quantity of *Habenaria bifolia* a little farther on. Out of the wood, and on to a grassy knoll, where we had a fine view of Kent stretching for miles and fading away into the Sussex hills. Just a bit of lunch; then we turned into a copse on our right; here we found *Cephalanthera grandiflora* in full bloom and plenty of it; out again, down a disused chalk-pit; here growing were *Helianthemum vulgare*, *Hippocrepis comosa*, *Pyrus aria*, *Viburnum Lantana*, and a few stray specimens of *Aceras anthropophora*. Left here and walked down to the small village of Kemsing,

noticed the quaint old church, which has lancet-shaped windows, and, if report says true, is built on an old Roman temple; next came to St. Edith's Well, which originated, not from the chalk hills, as we profane moderns think, but from St. Thomas à Becket's staff; he, good man, travelling by the pilgrims' way, feeling thirsty, stopped at Kemsing and struck his staff into the ground, from whence, we are told, gushed the water. After taking a good draught from it, and gathering some of the *Asplenium Ruta-muraria*, which grows on the wall built round, we set out on the dusty road. Before we got far, one of my friends drew my attention to the curious lacinated variety of Elder (*Sambucus nigra laciniata*) growing in the hedge; further on we came to a specimen or two of *Lathraea squamaria*, which the road-man had tried hard to destroy by throwing a heap of stones on it; but no, he had left three untouched, all with seeds; one we gathered, and left two. Turned back a little way, and down a lane past an old farmhouse, where we found on a wall *Ceterach officinarum*—this, by the way, a rarity in Kent. We must scarcely mention a closer description of the locality than this, or the herb collectors would be after them, but enough to say, if any botanist searches for it, he will be rewarded. Over a field, and narrowly escaping wet feet by plumping into a boggy ditch, out into a pretty country lane; we walked down here for about half a mile, and then came to the (L. C. & D.) railway bridge, under which we pass, and into the meadow on the left-hand side; here we gathered *Orchis mascula*, *latifolia*, and *Morio*, also *Valeriana dioica* by the side of the ditch. Out into the road, and a little higher up we found a beautifully variegated variety of *Sambucus nigra*, all the veins being surrounded with a broad cream-colour border.

Up the short but steepish hill, the road delightfully overshadowed with the green foliage, and relieved here and there by a bit of blue sky; then on to the Chart (Seal); here *Juniperus communis* is very common; among the fir-trees we found *Convallaria majalis* flowering very sparingly; this, I believe, is the characteristic of the uncultivated plant *Lomaria spicata*, of course growing abundantly here.

On looking at the time, we find it to be five o'clock. And now we are close to Ightham; here I part with my friends and make my way through Inghatch (here by the roadside is a clump of *Lanium maculatum*), and on to Plaxtol, but go a bit out of my way to the copse at the bottom of Sheet Hill, where *Paris quadrifolia* and *Ophioglossum vulgatum* grow, the first-named plant being rather a local one in Kent. Gathering a specimen or two of each, I walk on to Plaxtol, and thence home, after having spent a most enjoyable day.

Hadlow.

F. W. E. S.

ON MOUNTING MICRO-FUNGI.

AS the seasons of the year revolve in rapid succession, each, and all, bring with them their own particular work and studies for the microscopist. When, as Horace puts it, "*Solvitur aeris hiems grati vice veris et Favent*," the ardent microscopist begins to prepare for his early campaign, over hill, through dale, and in the woodlands; again, when summer bursts upon him with all her warmth and beauty, he plunges deeper than ever in scientific research for objects dear to his own particular branch of study; autumn, too, finds him busily engaged wandering through fields lit up with the brilliance of the golden grain soon to be ingathered. At last comes winter, "clothed all in frieze," this is without doubt the season of all others when study and manipulation of his objects collected in the bright seasons are brought more particularly into play. Within his study, with his microscope and objects at hand, cheered by the friendly blaze and warmth of his own fireside, he feels that the dull dark months, as some consider them, are to him anything but dark and dreary. To such a time we have once more come, and to each and all it has brought its delightful work. My own particular study throughout this year has been the micro-fungi, those minute organisms which live on other plants. It is my intention therefore in this short paper to put before my readers, as briefly and as concisely as possible, a few brief hints, culled from my own experience, as to the best and the easiest way of mounting those micro-fungi for which we have made so diligent a search throughout the spring, summer, and autumn months, with, let us hope, plenty of success. I do not intend to enter into the minutiae of collecting the fungi and classing them. To those who at present have not taken to this most interesting branch of microscopical research, let me recommend a book which will give them all the knowledge on the head of collecting and classing they will require; I mean "Rust, Smut, Mildew, and Mould," by Dr. M. C. Cooke, a book to whose value and excellence all who, like myself, have used it and (let us hope) profited by it will, I feel sure, bear witness.

The mounting of micro-fungi is very simple, and may be classed under two heads:—

- 1st. Those specimens which may be mounted dry.
- 2ndly. Those which require some medium in which to be preserved.

And, firstly, of the apparatus required for dry mounting:—

1. Plenty of glass slips with ground edges.*
2. Thin glass circles of various sizes.
3. Three or four dozen vulcanite balls. *cell*
4. Sharp fine scissors (a pair).

5. Bottle of white-lead varnish.
6. Turn-table and camel's-hair brushes.

All these things being at hand, we may proceed to manipulate our fungi. Of course, the great Order from which so many dry mounts are taken are the *Æcidia*cei; we will suppose that we are about to mount a specimen of *Æ. Tussilaginis*. First, take the leaf on which the specimen is located, and with the fine scissors cut round the cluster-cup, leaving sufficient leaf to fill up the vulcanite cell. Having taken care that the specimen lies perfectly flat in the field, place a ring of white varnish round the top of the cell, and on this lay the thin glass cover. After allowing time for the varnish to dry, run two or more rings round, and neatly, as a finish, one of green in the centre of the white varnish. The slide having been duly labelled is then fit to place in your cabinet. Nothing is easier than this method, yet, like everything else, the novice may fail in his attempts to succeed, and after mounting a specimen *Æcidium* in the way above described, he will perhaps in a day or two be surprised to find he is unable to distinctly see his object through a dimness which appears to have come over the thin glass. This is caused by the object not having been properly dried. Great care should be taken that all specimens are *thoroughly* dried before mounting.

We now turn to the method of mounting in fluid, which is by no means so easy or so certain of producing good results. The apparatus and fluid required may be briefly named as follows:—

1. Ground-edge slips.
2. Thin circles.
3. Fine knife.
4. Spirit-lamp.
5. Glycerine jelly (the best).
6. Gold size.
7. White-lead varnish and brushes.

In this case we will take as our example for mounting a specimen of *Arctia bulbosum*, of the order Puccinia. Having seen that your slide is well cleaned, take the leaf with the *A. bulbosum* on it, and with the fine knife scrape on to the slide sufficient spores to fill the field of view without crowding it. Next take up some glycerine (which has been placed in a cup of very hot water in order to liquefy) in a dipping-tube, and gently let fall one drop on to the spores, then hold the slide over the spirit-lamp in order that all shall be warm, then *very gently* place the thin glass cover over the medium, and put the slide aside till cold. When the glycerine has well set, take a knife with slightly warmed blade and scrape all the superfluous glycerine from the outside of the thin glass cover; next run three rings of gold size round, allowing each to thoroughly dry before the next is laid on; after this has been done, finish with white and green varnish as in dry mounting. In this method the difficulty will be how to obviate air bubbles; these in working with glycerine are its great drawback. I

* Ground edge slips, though more expensive, are the cheaper in the long-run, as they are neater and of smaller compass.

am rarely, however, troubled with them, and I owe my success, I consider, to seeing that the glycerine is thoroughly liquid and warm, and that the thin covering glass is laid down on the spores and fluid in the *most* gentle manner. Be careful in mounting with glycerine what varnish you use, as there is scarcely one that is not affected by this fluid. After many trials and many failures with others, I have come to the conclusion that there is nothing equal to gold size.

Thus then have I very briefly endeavoured to point out the easiest and quickest way of mounting micro-fungi. In conclusion, let me add a word about the labelling of your specimens. Be *very careful*

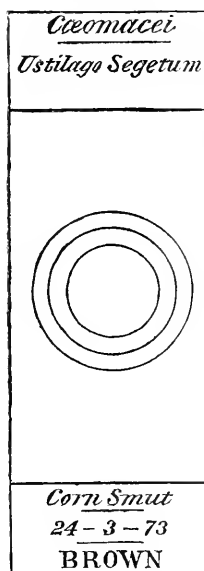


Fig. 1.—Example to show mode of labelling micro-fungi slides, and also of applying rings of coloured varnish.

jelly, viz. that which is as clear as crystal. There is some sold which looks foggy and muddy, so to speak. This, when viewed under the microscope, shows an amount of deposit of some kind, which, with such minute organisms as those of which I have been treating and with a high power, prove ruinous. The clearest glycerine jelly I ever remember to have used I procured of Mr. Dunscombe, optician, of St. Augustine's Parade, Bristol. It was put up in a test tube, which was fitted into a case; this doubtless could be obtained at any optician's, and is without doubt the best glycerine for mounting micro-fungi I ever met with. I trust that, this winter, many who have not yet turned their attention to micro-fungi mounting may at last be persuaded to do so, and I can promise them that the result will fully repay their labour.

CHARLES F. W. T. WILLIAMS.

ANOTHER FUNGUS RAMBLE IN EPPING FOREST.

LENZITES BETULINA occurs on the roots and stumps of old trees: it has the habit of a Polypore; corky, coriaceous; straight gills, somewhat branched when young, torn when old; pileus tomentose:—

Dedalea quercina and *D. unicolor*. The former is

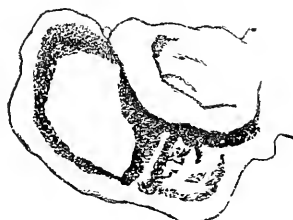


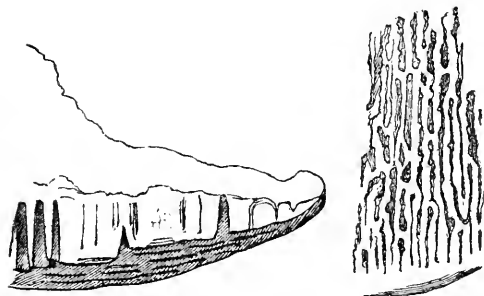
Fig. 2.—Tomentose pileus of *Lenzites betulina*.



Fig. 3.—Lamellae (old).



Fig. 4.—Lamellae in the young state.



Figs. 5 and 6.—Lamellae straight-branched and anastomosing of *Dedalea quercina* (young state).

nearest *Lenzites*, the latter, of more frequent occurrence, approaches *Polyporus*: both are similar in habit to this genus. The pileus of *D. quercina* is of a pale buff-colour, with concentric lines not unlike *Polyporus ulmarius*.

D. unicolor has a coriaceous, corky pileus, villosotrigose, cinereous, with zones of the same colour: The sinuses of both species are torn and labyrinthiform when old; similar in this respect to *Lenzites*.

The polypores are plentifully represented, both as

Boletus and Polyporus proper. The scientific distinction between the two is that in the former genus the hymenium of the cells is separable from one another and from the hymenophorum, which is not the case in the latter. Generally speaking, the polypores have a coriaceous, corky or even woody structure, while that of the Boleti is soft and spongy; but there are intermediate forms: *P. spumescens*, for instance, which we gathered from the dead trunk of a

The polypores are arranged in divisions, according as the stem is central, lateral, or wanting; besides these there are resupinate forms.

Of the stemless kinds, *P. versicolor* met the eye upon almost every other old tree-stump; rather handsome in the young state, before the rich velvety-brown tomentum of the pileus with its broad border of light drab variegated with zones of the same hue has faded; the hymenium is white, and pores so small as



Figs. 7 and 8.—Labyrinthiform pores of *Daldalea unicolor* (young state).



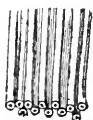
Figs. 9 and 10.—Hymenium of *Polyporus versicolor* (young state).



Fig. 11.—Reticulated stem of *Boletus edulis*.



Fig. 12.—Section showing the villose strigose pileus of *Daldalea unicolor*, and pores torn and widened when old.



Figs. 13 and 14.—*Fistulina hepatica* with pores (enlarged in 13).

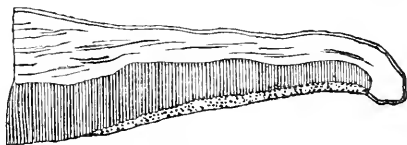


Fig. 15.—Section of *Polyporus lucidus*, showing the tubular hymenium.

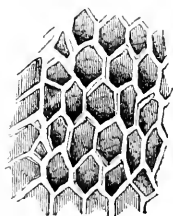


Fig. 16.—Large angular pores of *Boletus flavus*.

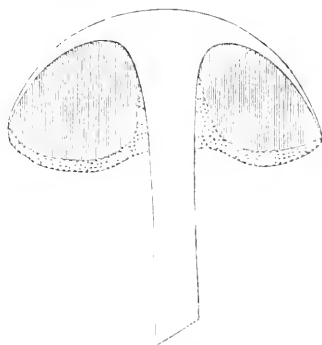


Fig. 17.—Vertical section of a *Boletus*, showing the porous hymenium.

tree, is somewhat spongy. The polypores are usually stemless, with lateral attachments to their matrices; the Boleti have stipes like an agaric; but *P. rufescens*, of which we found one specimen near the "King's Oak," is furnished with a central stipe: it is the prettiest of its tribe, the pileus is red and polished, especially on the broad border; hymenium white. *P. lucidus* (two specimens) is also a handsome fungus; it grows laterally from the roots of old trees; the pileus is of a dark reddish-bay (not unlike old red morocco), and polished; hymenium whitish.

to be scarcely perceptible to the naked eye. More general and protean in its forms is *Polyporus vulgaris*, a white, corky, closely adherent, resupinate species, with a most repulsive and sickening odour: on trees, sticks, stumps, everywhere; frequent and also resupinate, but not adherent, *P. ferruginosus*: pileus with hardly any substance, thin, and coriaceous; hymenium irregular; pores unequal; of variable habit, but usually growing laterally from old stumps. *P. tomentarius* was also observed on old trees.

Of Boleti we gathered specimens of six species.

These are in habit like Agarics (see figure). Most frequent, *B. chrysenteron*; brown and tomentose above, greenish-yellow below: *B. astivalis*; pileus dark brown, cracked when old, dirty white beneath: and *B. scaber*; much resembling it, but stipe covered with fibrous scales (both species in the wood behind Loughton). *B. edulis*, one small specimen, brownish above, whitish below (when young, but when old turning to a pale yellowish-green), the tubes elongated and half free; it may be known from its congeners by its stem, which is elegantly reticulated. *B. flammans*; pileus viscid, yellowish; hymeneal surface yellow; pores large, angular, ragged; stem cribose above with the decurrent tubes; not frequent. *B. elegans*; hymeneal surface lemon-yellow; of firmer substance than the preceding, and with much smaller pores; one specimen; copse below Woodford.

Plentiful this year was another plant of the Polypore family, of a soft, spongy, or fleshy consistence: viz. *Fistulina hepatica*, growing upon old oak-trees. Those who are unacquainted with its peculiar aspect could hardly credit its strong resemblance to a piece of raw bullock's liver, and still less imagine that so odd-looking and unattractive a thing can be edible. We had a portion of it dressed for dinner; the odour and flavour thereof were not bad, but it ate very much like what stewed gutta percha might do, and there was an after sensation upon the teeth and palate of astringency, referable no doubt to the presence of gallic acid. From a scientific point of view it is an interesting fungus, because different to other Polypores in that the hymenium is at first papillose, but when full grown the tubes are seen to be all separate and distinct.

(To be continued.)

CHEMICAL ACTION IN ITS GEOLOGICAL ASPECT.

By T. MELLARD READE, C.E., F.G.S., &c.

EVERY ONE is, no doubt, familiar with the fact that, in boiling most water in our common kettles, a white precipitate, known as "fur," forms on the inside of the vessel. This is specially the case with our well water, and is due to the fact that the water, in its passage through the pores of the rock, has dissolved and taken up, in solution, lime, in the form of a carbonate, which is precipitated in the process of boiling. This is not only the case with well water, but, to a greater or less extent, with river water, the relative amounts being due to the nature of the rock forming the drainage basin of the river. We are thus brought face to face with the fact that all natural water contains, however clear it may seem, extraneous minerals in solution, for not only do we find lime in it, both in the form of a carbonate and a sulphate, but also *magnesia, silica, potash, soda, iron*, and other minerals, in more or less minute proportions.

This may seem a very small matter, and a very weak instance of "chemical action," but these very forces, apparently so insignificant, have been mainly instrumental in fashioning this world of ours into its pleasing alternations of mountain and valley, hill and dale. But to make the importance of the fact plain, it is necessary to put some figures that will give an idea of the gross, as well as relative, quantity of minerals removed in solution by water. It is possible, you may think, that 19 grains per gallon of "solids in solution" is so small as to be unworthy of notice, but as regards the river Thames it means, according to Professor Prestwich's calculation, the removal into the sea annually of 548,230 tons of saline matter, or, roughly speaking, a ton a minute.

We thus see that all rivers are carriers of invisible material, and that, in addition to the mud, sand, and gravel which, the most unobservant person can see, is hurried along to the sea at every freshet, a slow and silent transference of materials is taking place with great uniformity of action, winter and summer, dry weather and wet, from the land seawards. The Rhine, the Rhone, and the Danube unitedly, according to calculations I have made, remove annually in solution over thirty-six million tons of saline matter.

By an elaborate calculation, but a thoroughly reliable one, I have arrived at the result that the rainfall removes, in England and Wales, matter in solution equal to 1 foot in thickness over the whole area (in round numbers) in thirteen thousand years.* But these effects of chemical action mean much more, geologically, than at first sight appears, for the removal of so much mineral matter in solution is, in most cases, the destruction of the cementing materials that hold the more insoluble particles of the rocks together, and their consequent degradation. It is as if the mortar of this building were dissolved out by chemical action, and the loose bricks, stone, and timber carried away by the first floods into the river Mersey. Therefore it is clear that, in order to account for geological changes of magnitude, we only require time and large areas of land for the rain to act upon.

The effects of chemical action on rocks is often apparent in an objectionable and costly manner in the stone used for building purposes. The decomposition and crumbling away of the new red sandstone of which Chester Cathedral was built is an instance, and in the Shrewsbury churches the decay is very apparent. The same may be said of the Permian sandstone, of which a church in Coventry is composed, while in Ludlow parish church the same action may be seen on the old red sandstone. The decay of these stratified rocks is largely due to their numerous planes of bedding and porous nature, permitting the penetration of water. Solid granite, however, not possessing any stratification, weathers and decays in

* Geological time. Presidential Address, Liverpool Geological Society, session 1876-77.

some cases, such as the granite used for building purposes about Dublin, the decomposition being very rapid. The decay appears to me to be due to the state of agglomeration of the grains of which it is composed, in addition to the chemical nature of its constituent minerals. Solid granite rocks decay *in situ* to the depth of many feet, and the resultant of the decomposition is, in Cornwall, kaolin or china clay. In the boulder clay about Liverpool, we find many decayed boulders of granite and greenstone, in some cases the core being preserved, and ringing like metal under the hammer, while the surface exfoliates and falls to powder. Limestone appears to be beautifully preserved in the clay, but exposed to the atmosphere it is dissolved away. These specimens show, in the case of limestone, the most delicate striations preserved, in the case of greenstone only a resultant powder.

If from such small examples we extend our views to natural scenery, we find that its character has been largely determined by chemical action. The valleys and dells of Derbyshire, so admired for their beauty, the gorge of the Chee Tor, the cliffs of Cheddar, in Somersetshire, all result from the dissolution of limestone by the chemical action of rain, but by far the most remarkable features of limestone districts are the caverns with which they abound. The Peak Cavern, Kent's Hole, Wokey Hole, the Mammoth Cave of Kentucky, are all produced by the continued action of water percolating from the surface through joints and fissures, removing the lime in solution, and enlarging, slowly but surely, its channels until large caverns are produced, sometimes underground rivers, and, finally, as the roof falls in, valleys.

Having just returned from a visit to the Burren, a remarkable limestone district in county Clare, by Galway Bay, I was much struck with the effect of chemical action on the scenery. There you have grand limestone mountains, rising terrace above terrace, in many places entirely bare of verdure, in others covered with grass, of the hue which gives the name of the "Emerald Isle" to Ireland, while a closer inspection shows most of the terraces and the sides of the mountains to be split up with joints in all stages of enlargement by rain wash, the upper surfaces often bare; in others with basin-shaped hollows holding water like a saucer, in which a fresh-water *Alga* grows. In others the joints may be overgrown with moss and verdure, giving a treacherous appearance of solidity—places to be avoided at the risk of a sprained ankle or broken leg—but by far the most curious thing is to see, perhaps 18 inches down at the bottom of the crevices, the surface rocks being bare, ferns growing in the greatest luxuriance. My friend, Dr. King, of Galway, pointed out to me that the decay of the *Alga* formed a very fine soil which washed into these crevices, forming a fitting support to the Maidenhair fern. The Alpine plant, *Dryas octopetala*, also grows in great luxuriance, and is the relic of a

former Arctic climate. In other places, where the rock is not "jointed," Dr. King informs me, there exist plains of bare limestone. Not a stream of water is to be seen in all this remarkable district, but many springs, which the inhabitants hold in superstitious reverence, and call "holy wells," sometimes forming very picturesque subjects for sketching; of this character is the one at Glen Inah, near Ballyvaughan. This continual solvent action on the rocks from the joints frequently quarries out large blocks of limestone, proving, I have no doubt, of great advantage to the builders of those remarkable structures called "Round Towers," the objects of so much controversy and little knowledge, of which the use has never been discovered, nor the date of their building fixed.

Lochs Mask and Corrib are both basins in the mountain limestone of Connemara. They communicate only by an underground river. To show the necessity of a knowledge of geology to the engineer, I may mention that during the famine an attempt was made to cut a canal to connect the two lakes for navigation purposes. The cut was made, but when the water was turned in, so fractured and fissured were the bottom and sides that the canal would not hold water, and it remains to this day a monument of misdirected energy.

To treat fully of the connection between scenery and chemical action would take up more space than I have at my disposal, but I trust in this short outline I have given an insight into the forces which produce natural beauties that charm the eye, or grander ones that awe the mind. The forces of the storm-tossed sea, the hurricane, the earthquake, and volcano, may seem much more potent and terrible, but the ever evenly enduring wear of the elements through chemical action produces in the end results quite as great, nay, greater, though it is so distributed and slow as to be unappreciable to the eye except in its effects after long lapses of time.

ON THE DEVELOPMENT OF THE HOUSE-FLY AND ITS PARASITE.

THE following remarks on the development of the house-fly are such as have come under actual observation, and the appended sketches were made by Mr. G. Harkus from the microscope, with the aid of a Beales reflector.

Mr. Harkus, with whom I experimented simultaneously, was fortunate, or the reverse, in having the required ova brought to him in this way. A fly having gained access to a cold joint of lamb considerably left a sufficient supply for his examination. The objectionable part of the arrangement was probably counterbalanced by his being enabled to fix the time of deposition with tolerable certainty. This was on July 28. The eggs (one of which is represented

in fig. 20, its diameter $\frac{1}{35}$ inch) were placed with a portion of the meat in a glass vessel, and next day the maggots had emerged as in fig. 21 (diameter $\frac{1}{25}$ inch), where the ramifications of the tracheal system may be traced.

The warm weather, coupled with the indoor heat, matured the larva rapidly, the change from maggot to chrysalis (fig. 19) being apparent at each observation, some having assumed this state on July 30. The perfect stage was reached and the fly emerged on August 5, or eight days from the deposition of the ova (fig. 18).

This was a week in advance of the result obtained in my experiment, which I preferred to conduct out

render the trachea, as well as the undulatory vermiform movement of the internal organs, apparent throughout under a low power; in fact, from its toughness, transparency, and strength, the larva is an excellent object for microscopic examination. When the animal matter was devoured, the maggots moved restlessly about, changing in colour from yellowish-white to brownish-red; the cuticle became dense and opaque; motion gradually ceased, until the perfect insect emerged by forcing of the segments of the anterior end of the shell, occupying from fourteen to fifteen days in completing its series of life changes.

Mr. Harkus's part of the experiment appears to be useful so far as to show the adaptability of the fly and its ova to circumstances, and that the larva assumes the chrysalid state when its supply of food becomes exhausted, although otherwise immature (in this case the animal matter given them would dry up), instead of dying from starvation.

The chrysalis and fly in his examples are undersized and impoverished, compared to those permitted to feed in a semi-fluid mass of animal matter.

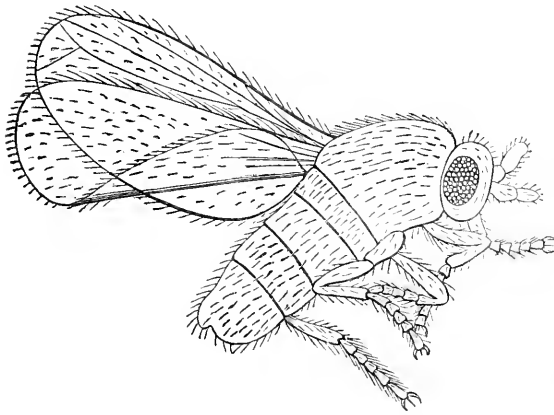


Fig. 18.—The House-fly (*Musca domestica*), magnified.

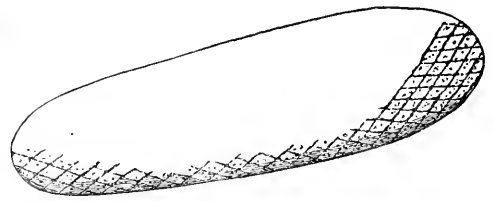


Fig. 20.—Egg of House-fly, July 28, 1878, $\times 30$.

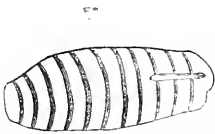


Fig. 19.—Chrysalis of House-fly, July 20, 1878, $\times 40$.

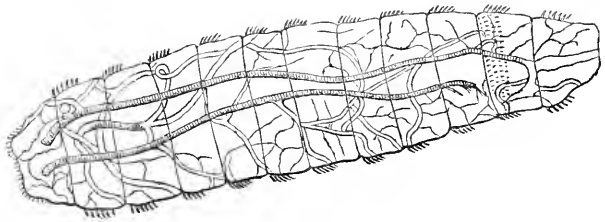


Fig. 21.—Maggot of House-fly, July 29, 1878, $\times 25$.

of doors. A piece of raw liver was exposed, which soon had eggs enough attached to it. It would appear that the fly has to some extent the power of withholding the deposition of her ova until a suitable medium is found for the requirements of the larva.

In two or three days the maggots were at work; their activity and voracity in devouring the putrescent mass of animal matter gave it the appearance of fermentation.

For observation in the live box, any little weakness connected with the somewhat objectionable odour arising from the garbage had to be got rid of and some few maggots washed clean. Neither immersion in water nor yet compression seemed to inconvenience them appreciably; their leathery integument is not easily ruptured, and is sufficiently translucent to

In autumn the house-fly seems specially the victim to the attacks of a parasitic fungus (*Empusa Musca*), and may be seen glued, as it were, to walls, a white powdery growth appearing at the segments of its body (the spores of the fungus). This vegetable pest is similar to, if not identical with, the parasite which causes so much destruction amongst fish in aquariums, and last year even attacked salmon in some English rivers.

The cause of the fly becoming so firmly attached to dry surfaces is this. The two pulvilli which, with two strong curved claws (perhaps best seen with the flesh-fly, *Musca vomitoria*, as a subject), terminate the foot are surrounded by a fringe of tubular hairs, each ending with a disc or sucker, through which a glutinous fluid exudes. These form the points of attachment, enabling

the insect to walk in any position, the action of the two claws detaching these points as the fly moves along.

When the ravages of the parasite have sufficiently weakened the fly by the destruction of its viscera, &c., it becomes incapable of active movement, and, remaining too long in a place, the viscid fluid continues to exude, and then the fly "sticks to the wall."

M. H. ROBSON.

A RARE SPECIES OF HEMIPTERA.

THE following species of Hemiptera being, I believe, an undescribed one, the account of it may not be uninteresting to your readers.

It was discovered in some water percolating through

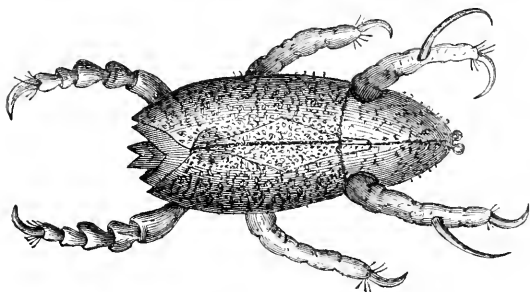


Fig. 22.—Dorsal aspect of sp. of Hemiptera.

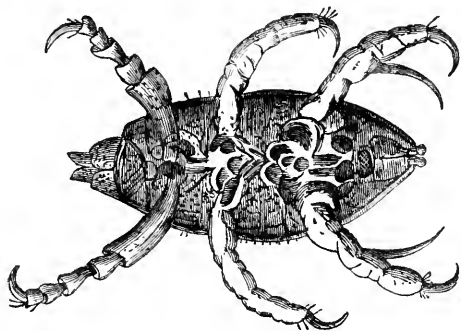


Fig. 23.—Ventral aspect of Hemiptera.

a crevice in an old wall, in conjunction with the *Oscillatoria decorticans*. Fig. 22 will give a general idea of the dorsal aspect of the insect. The rostrum was rather blunt, and at the apex were two small globose suckers, containing a viscid matter of great reflecting power. Eyes not apparent. The head was joined throughout its whole width with the thorax, with the exception of a small semicircular space on either side; from these spaces sprang the wing cases, which stamps it as an individual of an Order of the Hemiptera.

The sheath was closely covered with helical or screw-like markings, which could only be brought out distinctly with a high power, and forms a beautiful object for the microscope. The first pair of legs

were devoid of any transverse segmentations, the most singular feature being a long horny spine half the length of the leg, and curved towards the tarsus. I have not observed these appendages before on any insect. The foot was beset with seven or eight fine hairs terminating in a claw, which was continued into an unusually long and fine point. The middle legs resembled the pair last described, except that the long bristles were absent. The hind pair of legs were placed low down the meta-thorax, and were composed of five distinctly marked segments, the femur being about twice as long as the remainder of the leg. The tarsus gradually tapered, and ended in a single claw surmounted by hairs, the long spine being absent. The ventral view, fig. 23, shows the abdomen with its eight segments tapering to the anal region. The whole of the underside of the beetle was covered with very fine hairs.

Although I had the insect under observation for some hours in an excavated slide, I did not once see it use its wings or rise to the surface of the water as if for the purpose of breathing.

Its colour was a dark brown.

The elytra were a pale yellow, the markings being the same colour, but much more dense.

They resembled the wing case of the boatfly (*Notonecta*).

Size of the object about $\frac{1}{50}$ inch.

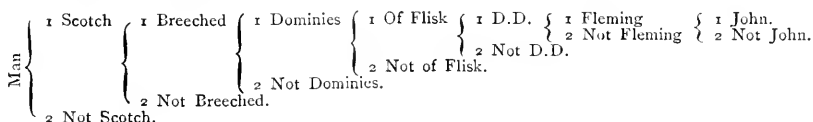
JOHN DAVIS.

A GLANCE AT THE SCIENTIFIC WORLD OF FIFTY YEARS AGO.

HAVING had lately to consult the volumes of the "Philosophical Magazine" for 1829-30, I have been much interested by the view of contemporary science which they afford. The volumes record the death of four great lights of science, two of chemistry, Sir Humphry Davy, Dr. Wollaston, and two of astronomy, Dr. Young and the Marquis de la Place. They contain the last papers written by the two first named: that by Sir H. Davy on the electricity of the torpedo; that by Dr. Wollaston on a method of rendering platina malleable. The advance which knowledge has made since that date is of course especially perceptible in geology. The writers of papers on that science seem mostly to look upon the literal accuracy of the Mosaic account of the creation and the Noachian deluge as an axiomatic truth to which the facts observed have to be made to fit. One writer repudiates the idea of mineral veins having their origin in fissures of the rock, and adopts an explanation similar to that of the Cromarty quarryman, who told Hugh Miller that, when God made the rocks, he made the fossils in them. Even geologists so philosophical as De la Bèche, Conybeare, and Lonsdale, stoutly maintain that the appearances presented by the rocks, and the physical configuration of

the surface cannot be explained by any forces now known to be in operation on the earth's surface, and call in the aid of "débâcles" (a word now as obsolete as the view which it embodies), or huge gushes of water, set in motion by the convulsions which produced the dislocations of the earth's crust known as faults. The difficulties which prevented the acceptance of the uniformitarian theory seem to be, first, an inadequate conception of the extent of past time (we find it maintained that valleys could not have been carved out by the erosive power of streams, since we find ancient British and Roman fortifications attesting by their perfect preservation that the form of the surface has remained unaltered since the time of their construction fifteen centuries ago); and, secondly, the phenomena then known as "diluvial." The glacial theory had not then arisen to throw a flood of light upon the origin of such phenomena as perched blocks and transported boulders, carried far from their native mountains, yet lying in the midst of fine clay.

In natural history we find the natural system



beginning to make headway against the overwhelming authority of Linnæus, an authority which it was looked upon as something little short of blasphemy to gainsay. We have heard of an entomologist who went through his cabinet and destroyed every specimen which he could not find described by Linnæus. So the medieval physicians declared that they would rather do wrong with Galen than do right with any one else. A Mr. Roscoe, who speaks in a tone of authority, declares that, whatever may be the merits of Jussieu as a botanist, it is sufficiently clear that they are not exemplified in the superiority of his arrangement as a nomenclature for the vegetable kingdom. "We are compelled to conclude that as a nomenclature and series of plants it is greatly inferior to that of Linnæus; and that however excellent it may be in some respects, it will never supplant in general use that long established work."

Another system which has not been equally fortunate in standing the test of time is the dichotomous system of the Rev. Dr. Fleming. A paper entitled "The Dying Struggle of the Dichotomous System" contains a criticism of that system, or rather of its author, in comparison with which the debate chronicled in the first chapter of the transactions of the Pickwick Club is amenity itself. The opening sentences will give a fair idea of its tone:—"Some years have now elapsed since a gentleman, the sable hue of whose vesture, if not the smile on his countenance, betokened that he should be at peace with all men, came up from the North to London, and announced himself to me as the Rev. John Fleming, D.D.,

minister of Flisk, N.B. I knew him at the time only by two or three articles in the supplement to the "Encyclopædia Britannica," which, if they be not fair specimens of a Scotch D.D.'s usual quantum of Greek, will at least remain a monument of his talent for writing on animals that he not only never saw, but would not even now know if he saw them. In addition to these truly novel specimens of entomological knowledge, I knew him also by a subsequent compilation called with much modesty 'The Philosophy of Zoology,' the first volume of which contains nothing new but some miserable plates, and the second little original except some names which have been framed in a proper independent spirit and with a noble contempt of Priscian. Thus we have *Trochusidae*, *Gordiusidae*, *Cicindellade*, cum multis aliis in *dæ* of similar calibre. Having *two* D's tacked to the end of his own name, the worthy minister doubtless thinks that he has a right to clap *one* to the tail of anything." The following example is given of the dichotomous system:—

The author of this satire is W. S. MacLeay. When Scot meets Scot then comes the tug of war. However, time brings its revenges, and if the worthy D.D.'s dichotomous system has failed to obtain recognition, his assailant's own pet "quinary system" has followed, or perhaps preceded, it into the limbo of exploded vanities. We may congratulate ourselves that scientific discussions are not now conducted in such a tone. Very different in style are some pleasantly written papers by Professor Schultes of Landshut, Bavaria, "On the Cultivation of Botany in England." The professor, in visiting England, was struck with the deep, full verdure of English vegetation. He had often heard and passed censures on the intense colours of the figures in English botany, but now perceived that the complaint was unfounded, the prevailing hue of vegetation being even of a deeper tone than there represented. He observed nothing in the flora of the roadsides which struck him as being different from that of Germany except *Ulex europæus* and "a species of *Rubus*, which, though called by all the botanists of this country *R. fruticosus*, is not the plant which bears that name on the continent, of which the corollas are always pale red." What a charming picture of simplicity! the critical botanists or "splitters" had not yet tried their hands upon this prickly genus.

The professor is justly indignant because Sir J. E. Smith, the president of the Linnean Society, and the most eminent botanist in England, was formally inhibited by the vice-chancellor of the university from delivering lectures on botany at Cambridge, because

he was a Dissenter. However, the university of Cambridge is not alone in not always acting in a spirit of wisdom: for the university of Landshut falls in for censure in that, while it spends 6000 florins on its beer cellar, it allows its botanic garden to fall into decay. Kew Gardens, in pre-Hookerian times, did not impress our author favourably, but he was highly delighted with those of the Horticultural Society at Turnham Green, being apparently captivated by the delicious flavour of the peaches and pine-apples grown there. The British Museum of those days, the present building being then only just commenced, he considered a disgrace to an enlightened people. He notes the fondness of the English for flowers: "The poor Londoner, who cannot afford to buy what is beautiful, will still, if possible, obtain something green to decorate the window with of his dark little attic, and give his last farthing for a bit of verdure." He is severe on the fiscal arrangements of those days, especially the window-tax and the duty on imported books. His herbarium being contained in some musty old volumes on law and divinity, he was charged thirty florins duty on them, to escape which he had to take out his specimens one by one and place them in papers bought for the purpose, and abandon his old folios to the Custom House officials. He visited Oxford, performing the journey in six hours, though at the risk of breaking his neck. He speaks with warm admiration of English botanists, especially of Mr. Don, whose reputation does not now stand so high as it then apparently did.

A curious example of the change which men's ideas have undergone in another department of human interest is afforded by a description of a "Parabolic Sounding Board" erected in Attercliffe Church by the Rev. J. Blackburn, minister of Attercliffe cum Darnall. The woodcut with which the paper is adorned shows a lofty pulpit of the "three-decker" pattern, surmounted by a huge erection like a dimidiated umbrella. This sounding-board was constructed on mathematical principles, and it was claimed that, if the preacher's mouth was exactly in the focus of the parabolic surface, an attentive hearer would perceive an effect that might be compared to the gentle swell of an organ.

We find various things now familiar to us announced as novelties. We are told where "those curious substances bromine and bromide of potassium, which we believe have not been hitherto prepared in this country," may be obtained. Iodine has also the interest of novelty. There is a paper, now historic, by Dr. Robert Brown, "On the Movements of Active Molecules"; and we may read the speech of the President of the Royal Society on delivering a medal to Mr. Charles Bell for his discoveries of the functions of sensory and motor nerves, in which he says: "Of all the branches of human knowledge, anatomy has experienced the greatest difficulties in struggling against passions, prejudices, and superstitions." We

may congratulate ourselves that the difficulties alluded to were in great measure removed a year or two later by the passing of the Anatomy Act; but the prejudice against the study of anatomy is not even yet extinct; and has it not been left to our present parliament to prohibit in effect physiological research in the land of Harvey, Hunter, and Bell, at the instance of an ignorant and sentimental clamour, based upon the groundless statements of disingenuous agitators?

The perusal of these volumes shows us how great the advance of science has been during half a century, both as regards the number of ascertained facts and the theories which connect them together and give life to the dry bones. It is not, however, for us to be puffed up with our knowledge; if we know more than our fathers, it is because we have inherited the fruits of their labours; and who can tell how much that which passes current with us to-day may have to be modified or set aside before another half-century has passed? We see how time tries scientific as all other work: if a theory be false, neither the prestige of a great name nor the sanction of authority can prop it from falling; if it be true, neither denunciation nor even ridicule can prevent it from becoming ultimately accepted.

II. F. PARSONS.

THE GEOLOGY OF IRELAND.*

ALTHOUGH less known to English geologists than any other part of the British Islands, the geology of the "Sister Isle" is, perhaps, for many reasons, the most interesting and instructive. Representatives of the most important formations are here found developed after a manner different to what they are seen elsewhere. There is "eozoönaal" structure in the pure marbles of Connemara; characteristic zoophytes (Oldhamia) in the Cambrian slates of Bray Head and the Wexford Mountains; peculiar Silurian fossils, as well as rocks, in the iron-bound coasts of the west; a wealth of Devonian ferns and cryptogamia in the fine sandstones of Kilkenny, such as no other member of this ancient formation has yet yielded; carboniferous rocks which, in addition to the characteristic forms found elsewhere, have a fauna of their own—strange-looking fishes, amphibians, and labyrinthodonts. The carboniferous limestone stretches over the greater part of midland Ireland. Then we have triassic, Rhætic, and a little oolite, succeeded by chalk, miocene shales, and relics of volcanoes and volcanic lava flows; drift beds even more distracting in the numerous forms they assume than their representatives in England or Scotland;

* "Manual of the Geology of Ireland." By G. Henry Kinahan, M.R.I.A., &c., of H.M. Geological Survey. London, C. Kegan Paul & Co.,

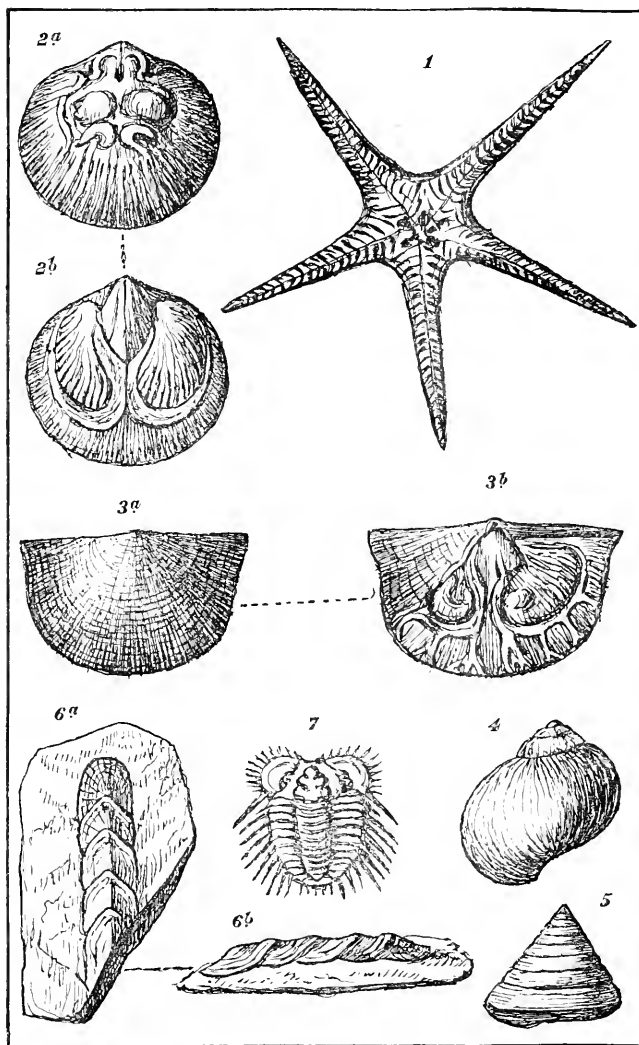


Fig. 24.—Cambro-Silurian and Silurian Fossils. From Kinahan's "Geology of Ireland," Plate II.

post-glacial peat-bogs, turbaries, relics of ancient man and ancient art—surely in this short summary of rocks of every geological age and mineralogical character we have the secret of that picturesque and scenic natural beauty which the "Green Island" possesses more than any other in the northern hemisphere.

Mr. Kinahan's "Manual of Irish Geology" is a most useful addition to our scientific literature. No other geologist was so competent to the task, for Mr. Kinahan has been engaged on the Irish Survey for many years, and now occupies the honourable position of senior geologist. He has in person examined, worked out, mapped, and surveyed the most difficult and important parts of the geology of Ireland. He has long been recognised as a keen observer of physical geology, and the book before us is filled with the results of a life's hard work. The

Geology of Ireland, physical and stratigraphical, is treated in the methodical detail which is most valuable to a student. We might take exception to some of Mr. Kinahan's conclusions as to the evidences of *marine* denudation he freely quotes, for in many respects the author is antagonistic to the "subaerialists" in geology who at present have the explanations all their own way. And we think it would have been better if the old instead of the *new* technical terms had been adopted.

The book is divided into five sections, each containing several chapters. These sections are devoted severally to "Sedimentary Rocks," "Metamorphic and Eruptive Rocks," "Superficial Accumulations," "Physical Features," and "Economical Products." It is illustrated by many woodcuts, the sketches of which are original, and some very good; and also by eight plates of fossils, &c., of whose merit the reader can best judge by the two which, through the kindness of the publishers, we are enabled to lay before them. The style in which the book is written is well suited to the subject, being matter-of-fact and clear. Mr. Kinahan, with Irish generosity, adopts the commendable practice of giving to all those geologists who have in any way helped him, or whose works are quoted, the fullest credit they deserve.

This "Manual" will henceforth be necessary to the student of the geology of the British Islands, and particularly that of Ireland. It is in every sense of the word most credit-

able to its author, and we hope it will bring him the scientific honours he so well deserves.

MICROSCOPY.

"THE GERM THEORY OF INFECTIOUS DISEASES."—This is the title of the address delivered by Dr. Drysdale, as president of the Liverpool Literary and Philosophical Society. It is a pamphlet of 74 pages, published by Baillière, Tindall, & Cox. We know of no other similar paper which is so clear and comprehensive, so original and logical. It is not only a capital summary of all that has been said and written and experimented on this most important subject, but it lays down the basis of new experiments, with a view to determining the simpler and less complex theories.

A NEW LAMP FOR MICROSCOPIC MOUNTING.—In mounting balsam slides, I find that a small benzoline lamp with opaque white glass answers admirably in the place of the spirit lamp and brass plate advocated by so many writers on microscopic mounting. The slide may be laid flat across the lamp-glass, and the heat can be regulated to any degree by means of the rackwork. The light which this lamp gives enables the worker to detect any moderate-sized air-bubbles, while the opaque lamp-glass prevents the light dazzling his eyes. The cost of this lamp is only 1s. 6d., and it may be bought of almost any oilman.—*Geo. Clinch, West Wickham, Kent.*

SECTION CUTTING.—Messrs. J. & A. Churchill have just published a neat little manual by Dr. Sylvester Marsh, entitled "Section Cutting: a Practical Guide to the Preparation and Mounting of Sections for the Microscope." Special prominence is given to the subject of animal sections. It is a most useful little book, and cheap, the price being, we believe, half-a-crown.

THE QUEKETT MICROSCOPICAL CLUB.—No. 38 of the "Journal" of this popular and useful club has just been published, containing papers as follows:—"On an Apparatus for Use with Powell's Small Bull's-eye Illuminator," by Geo. Williams; "On the Influence of Diffraction in Microscopic Vision," by F. Crisp, LL.B.; and the address of the late president (Henry Lee, F.L.S.). Prof. Huxley has been elected president for the ensuing year.

MICROSCOPY IN NATAL.—I have much pleasure in informing you that we have, in our little colony, just founded a microscopical society, which bids fair to be very successful. It is called the "Natal Microscopical Society," and is under the presidency of Julius Schulz, M.D.—*Stephen C. Adams, Hon. Sec.*

SECTIONS OF QUARTZ.—Would Mr. J. Clifton Ward kindly describe how he obtains and prepares for the microscope the "slices" of quartz he speaks of in his interesting articles in SCIENCE-GOSSIP?—*R. S. P.*

DIATOMS IN COAL.—In reply to F. W. Kitton's communication, I only write to say that, when I saw diatoms in coal first mentioned, I tried the ashes of the coal we were then burning, and found abundance

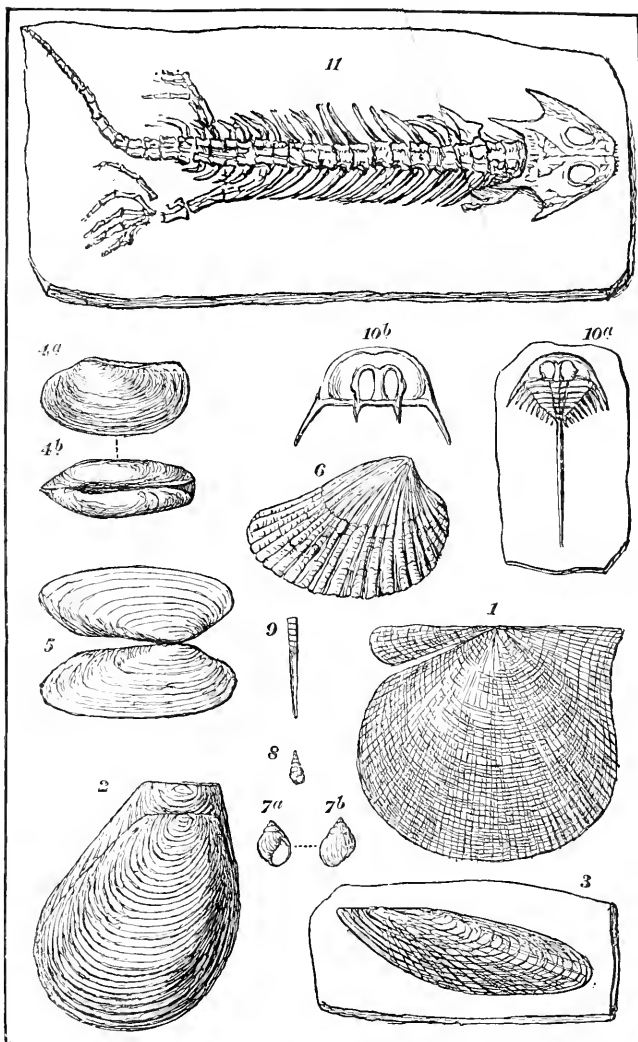


Fig. 25.—Upper Carboniferous (Coal-Measure) Fossils. From Kinahan's "Geology of Ireland," Plate IV.

of them of several different kinds, and from several different specimens of ashes, but I do not think they will be found in all kinds of coal.—*Edward Thomas Scott.*

ZOOLOGY.

SCIENCE IN THE PROVINCES.—The number of "Proceedings," "Transactions," &c., which reach us, setting forth the work done in the scientific centres which now exist in almost every town in Great Britain, is increasingly great. One of the best managed of these provincial societies is the West Cumberland Association for the Advancement of Literature and Science, which is formed by the union

of eight societies in as many of the Cumberland towns. Their "Transactions" form a tolerably large annual volume, and part iii. is now to hand, containing, among other papers, reports, and presidential addresses, one on "The Probable Condition of the Interior of the Earth," by Sir George Airy, K.C.B., F.R.S.; on "Quartz," by Mr. J. Clifton Ward, F.G.S.; "Boulde' Clay," by Charles Smith, F.G.S.; "Common Beetes," by W. Duckworth; &c.—The annual report of another flourishing and vigorous society, the Belfast Naturalists' Field Club, is also before us, containing, besides several papers of more than local interest, the result of special geological research in the Silurian rocks of county Down, by William Swanston, F.G.S., and their hitherto unknown and unclassified graptolites, by Mr. Charles Lapworth, F.G.S. Mr. Joseph Wright, F.G.S., also gives a carefully worked out and arranged list of the recent foraminifera of Down and Antrim. These three contributions would alone make any report valuable to naturalists and geologists generally. There are also papers, chiefly geological, by Messrs. W. Gault, W. Gray, &c., and well-written accounts of the summer excursions.—The twentieth report of the East Kent Natural History Society has been sent us, showing a healthy state of scientific activity. The abstracts of the papers read at various meetings are very clear. Prominence appears to be given to microscopical examination of natural history subjects, to which Mr. James Fallagar, Mr. Hammond, and Professor Gulliver contribute very importantly. There is also a good abstract of the address by the president (Mr. G. Dowker, F.G.S.) on flint stones and banded flints.—The Dulwich College Science Society have issued their first annual report, and we cordially hope it will be the pioneer of many to follow. It commences well, by "reporting" on the botany, zoology, &c., of the neighbourhood, and contains abstracts of papers read at the bi-monthly meetings.—The Eastbourne Natural History Society is favoured by having several naturalists of note among its leading members. Mr. Roper, F.L.S., has recently addressed the society on "The Additions to the Fauna and Flora of the Crickmere District during the Past Year."—The North Staffordshire Natural History Society have had several important summer outings, at which interesting papers have uniformly been read.—The various societies at Burton-on-Trent, Nottingham, Birmingham, Leicester, Northampton, Tamworth, &c. have had capital abstracts of their proceedings published in the "Midland Naturalist," which has now reached the conclusion of its first volume, and proves a most ably edited "Journal of the Associated Natural History, Philosophical, and Archaeological Societies and Field Clubs of the Midland Counties."

THE GEOGRAPHICAL DISTRIBUTION OF ANIMALS.—We have received a coloured map showing the six

geological divisions of the globe, according to Wallace and Sclater. It is published by Messrs. W. & A. K. Johnston, and has been arranged by Dr. Andrew Wilson. The map is accompanied by a small handbook, which gives the necessary explanatory matter.

THE BLACK-THROATED STONECHAT.—At a recent meeting of the Zoological Society, Dr. Sclater exhibited and made remarks on an adult specimen, in full plumage, of the black-throated stonechat (*Saxicola stapazina*), which had been obtained in Lancashire, and had been sent for exhibition by Mr. R. Davenport, by whom an account of it was lately written for SCIENCE-GOSSIP. The species had not been previously recorded as occurring in the British Isles, and is an interesting addition to the list of "Accidental Visitors."

THE BLACK-THROATED STONECHAT IN LANCA-SHIRE.—Your correspondent, "R. Davenport," in the October number of SCIENCE-GOSSIP, may congratulate himself on being the first to record the occurrence of *Saxicola stapazina*, or "russet wheatear," in the British Isles. I have for years anticipated and longed to hear of the appearance of this species on our side of the Channel, and wondered why (at least) a straggler should not occasionally appear at the same time with its near relation, *S. ananthe*. There is a capital coloured figure and description of *stapazina* given, amongst other continental or European species, in Bree's "History of the Birds of Europe not found in the British Isles."—*John Gatcombe*.

ZIPHIUS CURVIROSTRIS.—The drawing forwarded to me is undoubtedly that of the skull of a specimen of *Ziphius curvirostris* (Cuv.), a species often found in the Mediterranean (see my article on "The Seals and Whales of the British Seas," SCIENCE-GOSSIP for February 1878, p. 29). Dr. J. E. Gray, in his "Catalogue of Seals and Whales in the British Museum," says that this species "has long been regarded as fossil. It really exists in the Mediterranean. The skull described by Cuvier ('Oss. Foss.' v. t. 27, f. 3) was found by the fishermen of the Gulf of Bouc. Others have since been obtained, and each of them has been described as a new species." See also Professor Flower "On the Recent Ziphiid Whales," "Trans. Zool. Soc." vol. viii. p. 207. Professor Fowler has seen the drawing forwarded by M. Piercas, and has no hesitation in ascribing it to this species.—*T. Southwell*.

PRESERVING SKINS, &c.—The following is a French substitute for arsenical soap:—Savon blanc, 625 grammes; sulfate d'alumine et de potasse, 250 gr.; sous-carbonate de potasse pulvérisé, 125 gr.; chlorure de sodium, 125 gr.; chaux en poudre, 250 gr.; camphre en poudre, 60 gr.; eau, 750 gr.; huile de pétrole, 60 gr. Gently boil the soap and salts together in two-thirds the water. Mix the lime with the

remainder. Dissolve the camphor in the petroleum. Mix the whole when cold.—*J. S.*

PORTUGUESE MAN-OF-WAR (*Physalia pelagica*).—It will doubtless be interesting to many of your readers to learn that a specimen of this exquisitely beautiful marine creature has been picked up at the Isle of Wight. During a storm which prevailed about the middle of October last, I was watching the waves at Bonchurch, when I observed a singular-looking object on the beach. Upon a closer inspection I discovered it to be a fine specimen of the *Physalia pelagica*. In the "Intellectual Observer," published in November 1862, an accurate figure is given of one, also obtained at the Isle of Wight in July of that year. The colour of that found by me was, however, of a richer crimson, nearly the whole of the semi-transparent membrane being of that colour, the surface of this membrane being tinted with an exquisite blue, so that, when held at any angle, the most lovely shades of purple, blue, or crimson were to be obtained, giving the exterior of the object the appearance of shot silk. The pendent tentacula were slightly injured, but still retained their lovely blue colour. Being at some distance from home, and having no vessel in which to convey it, I returned it to its native element, but fear that it did not long escape destruction upon the pebbly beach, upon which the waves were breaking with great force.—*Edward H. Robertson.*

"HEALTH PRIMERS."—By this title, Messrs. Hardwicke & Bogue have issued the first instalment of simple handbooks on health subjects, such as anyone can afford to purchase (a shilling each volume), and anyone can understand and be interested in when bought. They are severally written by the ablest medical writers of the day; and the complaint is now altogether removed that clearly written and inexpensive books on subjects of this kind do not exist for the benefit of the masses. The first four volumes treat on—"The House and its Surroundings"; "Exercise and Training"; "Alcohol: its Use and Abuse"; and "Premature Death: its Promotion and Prevention." These books are capitally got up, with good type and good paper.

SCIENCE-GOSSIP FOLK-LORE.—Mr. James Britten, F.L.S., has compiled a capital and useful Index to the Folk-lore in the First Series of Hardwicke's SCIENCE-GOSSIP, vols. i.-xii. (1865-1876), which has appeared in the "Records of the Folk-lore Society."

THE BONY PIKE (*Lepidosteus osseus*).—This well-known living representative of the nearly extinct order of ganoid fishes, so abundant in the seas of the primary epoch, is not uncommon in the North American lakes and rivers. Within the last few months the development of the young fish, as they escape from the

eggs, has been studied by Professor A. Agassiz, who says "that, notwithstanding its similarity in certain stages of its growth to the sturgeon, notwithstanding its affinity with sharks by the formation of its pectorals from a lateral fold, as well as by the mode of growth of the gill-openings and gill-arches, the *Lepidosteus* is not at all so far removed from the bony fishes (Teleostei) as is generally supposed."

BOTANY.

EPIPACTIS PURPURATA (Sm.).—I have found this plant growing in tolerable abundance under the shade of a clump of trees. It seems to me to be quite a different variety from *E. latifolia*. The whole plant is larger, except the leaves, which are much smaller and narrower in proportion, and lie closer to the stem, than those of *E. latifolia*. The stem and roots are thicker and more fleshy, and the latter grow much deeper in the ground than those of *E. latifolia*. The flowers are always of a yellow-green colour, slightly tinged or lined with pink, there being no difference of colour within the lip. The lower bracts are twice as long, and the upper ones about the same length as the flowers. I have found *E. latifolia* both in chalk and alluvial soil; but *E. purpurata* in the latter only. I have seen nothing intermediate between this plant and *E. latifolia*. Its purple colour is most decided.—*Walter Longley Bourke.*

VEGETABLE MOTH-TRAP.—In reply to your inquiry in page 259 of SCIENCE-GOSSIP for November, my attention was directed to the number of insects, moths, bees, &c., caught by the flowers of *Physianthus* growing against a house at Newton Abbot, Devon, in 1875. My impression is, that they do not die in two minutes, but that some of them, at least, live for two or more days after being caught. I have had an opportunity every year since 1875 of observing this plant, and though it exudes a thick milky juice on fraction, I cannot discover that this is of a narcotic or soporific nature, as many insects which appeared to have been some time captive, flew away readily on being released. I am inclined to believe that the action is purely mechanical, but have been unable to discover whether the plant has any power of opening and closing the trap, or whether the insects entangle themselves. I have reason to believe that many have been more or less entrapped two or three times before their final capture. It would take too long to enter into a minute description of the structure of the flower, which I have minutely examined. I brought this plant before the notice of the East Kent Naturalists' Society in 1875. The plant to which I allude is growing in the open air with a south or south-east city aspect, but though it flowers profusely, it has never formed seed: can you explain this?—*John P. Hall.*

PHYLLACTIDIUM PULCHELLUM.—I have a large number of freshwater plants, *Phyllactidium pulchellum*, growing upon the glass sides of a tall cylindrical *Vallisneria* aquarium. and as in *SCIENCE-GOSSIP*, 1867, p. 178, it is requested that new localities for this plant should be made known, I herewith send the information. The water was furnished from the Kennet and Avon Canal at Bath, but it has frequently been supplemented by ordinary rain-water.—*R. H. Moore.*

A NEW CATALOGUE OF BRITISH PLANTS.—The Rev. George Henslow contemplates printing a catalogue of British plants, arranged according to Hooker's "Student's Flora." Any one wishing for copies, is requested to communicate with him at 86 Titchfield Terrace, Regent's Park, N.W.

MALFORMATION OF THE WALLFLOWER.—A peculiar growth of this fragrant plant was recently observed by me, the peculiarity in this case partaking of a combination of petals, stamens, and pistil, to form a six-celled body. The sepals of the calyx were dark purple—almost black; the plant remarkable for vigorous growth. In florists' flowers, stamens and pistils are converted into petals; in this instance there is a reversion of this phenomenon in a spontaneous manner.—*M. King.*

AUTUMN RAMBLE IN EPPING FOREST.—Dr. De Crespigny is hardly right when he says, regarding Agarics (p. 254): "In one sub-genus there is no stem—*Pleurotus*." The larger species of this sub-genus have a distinct and often very large stem, some indeed being furnished with an annulus. *A. (Pleurotus) Ulmarius* (illustrated as stemless on p. 252) always has a thick stem. Mr. Berkeley's *A. Ceciliæ* certainly grows in Epping Forest, but it is not a "much smaller" species than *A. rubescens*; it is in characteristic specimens much larger: indeed *A. Ceciliæ* is a decidedly large Agaric; its correct name is *A. strangulatus*, Fr., *A. Ceciliæ* being a synonym. Why is *A. nudus* said to be "probably a very dangerous species"? I have known it eaten without ill-effect during late years. *A. (Pholiota) aureus* described as growing near the "Wake Arms," does not grow in Epping Forest: the plant mentioned by Dr. Crespigny is *A. spectabilis*. *A. aureus* found a place in Berkeley's "Outlines" by an inadvertence: it has only been known of quite late years as a British plant. A few years ago a variety of this species was found at Downton, near Ludlow, whilst I detected the true plant at Perth, three years ago. *A. aureus* is very rare, whilst *A. spectabilis* is common everywhere.—*W. G. Smith.*

A STRANGE PLACE FOR MARSH PLANTS.—I have been interested in the record of the occurrence of plants in the new docks at Leith, as given by Mr. Douglas in the last number of *SCIENCE-GOSSIP*. As

all the plants given in his list are natives of the south side of the Forth, and are to be found all along the coast from Bowness to North Berwick (in damp and marshy places) it is quite unnecessary to *imagine* the previous existence of a *stream* in order to account for their appearance; most of them used to grow at the Figgat Whins, between Leith and Portobello.—*A. Craig-Christie.*

MONSTROSITY IN DIGITALIS PURPUREA.—An instance of monstrosity in the flower of a cultivated foxglove came under my notice last summer. It was



Fig. 26.—"Monstrosity" (*Synanthly*) in Common Foxglove.

an example of the malformation called "synanthly," which consists in the more or less complete union of several usually distinct flowers. Dr. Masters, in his "Vegetable Teratology," p. 40, illustrates a somewhat similar case, and indeed shows that the corolla of the foxglove is liable to various forms of monstrosity, such as the production of a spur, the formation of a polypetalous corolla by fission, and the occurrence now and then of a regular corolla. In the specimen I have here figured, the flowers at the top of the raceme not only

grew together into a cluster, but so grew as to form a single cup, nearly four inches in diameter, not unlike a shallow convolvulus with a very irregular margin. The cup so formed, however, was not complete, having a slit down one side—a feature I should perhaps not have noticed had not the figure in Dr. Masters's work shown the same formation very plainly, whence I infer that it may be usual. Inside the cup was only a confused mass of distorted petals, stamens, or carpels, while below it was an involucre formed by the cohesion of the bracts of the several flowers. When I gathered the specimen last June, every other stalk on the plant showed promise of producing a similar irregularity, though then only in bud.—*John W. Buck, B.Sc., New Kingswood School.*

DESTRUCTION OF ISOETES LACUSTRIS BY FISH.—I was geologising lately at the lakelets on the ice-worn summit of Fairhead, county Antrim, and observed a large quantity of fragments of the quill-like leaves of *Isoetes lacustris* floating in the water. On examining the pieces I found they were all freshly champed and bitten, the broad, flattened part of the base was in every instance almost eaten away. Turning into a shallow little bay, I found this wholesale destruction of this very interesting plant was caused by a number of common black trout. They were busily engaged nibbling and biting off the basal part of the quills. I saw several of them with portions in their mouths darting away into the deeper water. The weather was very dry, and had been so for a long time previous; in consequence, the water of the lakelets was low, and the brooklets flowing into them were all dried up. The supply of worms and other food brought down into the lakelets by the streams was cut off owing to this cause, and the fish were forced to feed on the Quillwort. This was the only plausible explanation I could offer to account for the strange conduct of the fish, but perhaps some of the readers of SCIENCE-GOSSIP have observed something similar, if so, I would very much like to be informed of the circumstance. In conclusion, I may state that the Quillwort, *Isoetes lacustris*, is a very rare and local plant in this district; only two stations are recorded for it in county Antrim, these are the little lakelets on Fairhead, and the river Bann, near Jackson Hall.—*William Gault, Belfast.*

GEOLOGY.

DWARF FOSSIL CROCODILES.—Professor Owen has recently described some fossil crocodiles found in rocks of Purbeck age, under the name of *Theriosuchus pusillus*. This crocodile was only 18 inches in length. As regards its derivation, it appears to be related to the theriodonts of the Trias.

THE UPPER GREENSAND CORAL FAUNA OF HALDON, DEVONSHIRE.—This was the title of a paper recently read before the Geological Society, by

Professor P. Martin Duncan, F.R.S. The author in this paper stated that since the publication of his supplement to the "British Fossil Corals," published by the Palæontographical Society, several new corals have been obtained at Haldon by Mr. Vicary, of Exeter. Twelve additional species were noticed, of which ten were new. This brings the total number of species in the Haldon greensand up to twenty-one. The new species are thus distributed:—Aporosa: Oculinidae (1), Astræidae (3), Fungidae (5); Perforata: Turbinariæ (2); Tabulata (1). The paper concluded with remarks on the genera and species represented, from which it appeared that the coral fauna of Haldon is the northern expression of that of the French and Central European deposits, which are the equivalents of the British upper greensand. The Haldon deposit was formed in shallow water, and the corals grew upon the rolled débris.

HOLES IN OOLITIC LIMESTONE.—In SCIENCE GOSSIP for November, F. N. D. asks why holes are found in oolite beneath sand. I cannot say for certain that the cause I have seen at work with a similar effect is certainly the cause for the holes mentioned; but as I know of no other equally efficacious, I tell him what I have seen. Holes in limestone and basaltic rock caused by small surface hollows—water percolating through the superstructure acts on sand particles in these hollow places, and the sand grains act as gimblets or gouges by constant friction; the rock is worn away, and holes are made for a few inches to many feet in diameter. In the large holes pebbles and gravel take the place of sand, and wear out deep cavities; in places where the water action is confined to dripping, the holes are deep and uniform; where they are exposed to running water the erosion assumes varied shapes. The holes described by F. N. D. are most likely made by water drops and sand in a rock formed of some shale or soft material.—*H. P. M.*

THE THERMAL SOURCES OF CARLSBAD.—The recent demolition of a house has led to the discovery of a remarkable geological fact—the existence of a peculiar zone, about 15 to 20 metres broad, between the steep pyritose granite, with frequent veins of hornstone on which the town tower stands, and the similarly pyritiferous granite creeping out beneath the terrace of the Schlossberg. This zone is filled up with a breccia of granite and hornstone, with thermal waters circulating everywhere within its fissures, and depositing on their inner surfaces crusts and veinules of arragonite, some of them $1\frac{1}{2}$ metre thick. The temperature of the whole zone is high, on account of the warm water and steam issuing out of every cleft and crevice.

MARINE FOSSILS IN GANNISTER BEDS.—I was much surprised to learn that Professor G. A. Lebour announced the discovery of marine fossils in the lower coal measures or "gannister beds" of Northumberland, and that "hitherto no marine fossils had been

met with in these rocks." We in Oldham are situated within an easy walk of a long and well-developed outcrop of these gannister beds, and I have been intimately acquainted with them for upwards of twenty years, yet, in a palaeontological sense, it has never occurred to me that this series, with some limitations, could have had any other origin than a marine one. From the time of my first acquaintance with these beds I have believed that such fossils as *Goniatites*, *Orthoceratites*, and *Nautili*, were the remains of marine mollusca.—*Jas. Nield, Oldham.*

WHAT ARE CONODONTS?—It will interest our geological readers to know that at another recent meeting of the Glasgow Natural History Society, Mr. John Young stated that he has been enabled to compare Mr. Smith's carboniferous limestone conodonts with the series of Silurian forms so beautifully figured in the plates of Dr. Pander, and that he finds in these plates that at least five of the Silurian genera are represented amongst the carboniferous specimens. These genera are *Cardylodus*, *Gnathodus*, *Ctenognathus*, *Prionodus*, and *Lanchnodus*. Of some of these genera there are one or two species that are so closely related to the Silurian forms that it is difficult to point out any characteristic distinctions between them. Mr. Young stated that Professor Owen in his "Palaeontology," first edition, p. 96, says, "The writer, after the closest comparison and consideration of the evidence, is disposed to regard only those referred by Pander to the genera *Ctenognathus*, *Cardylodus*, and *Gnathodus*, as having any probable claim to vertebrate rank." It is therefore interesting to find, as already noted, that these three genera are represented amongst the carboniferous forms, and it becomes highly probable that the other genera may yet rank amongst the vertebrates likewise. In the deposits yielding these remains are found beautifully preserved vertebral bones, apparently of small fishes, while another tooth somewhat closely related to *Aulocodus* (Pander) and scales like *Cœlolepis* (Pander) are also found. Mr. Young also stated that amongst Mr. Smith's specimens were one or two slides of stout, minute, conical teeth, about a line in length, of a round form, slightly curved, hollow at their base, and tipped at their points with transparent dentine or enamel. These teeth differ from the conodonts figured in Pander's plates, in being nearly circular in section, while the Silurian forms in most instances have sharp opposite margins. The carboniferous specimens may therefore belong to true fishes, of which there is plenty of other evidence in the same beds.

NOTES AND QUERIES.

DO BLACKBIRDS MIGRATE?—In the spring of 1876 a brood of blackbirds was hatched in the nursery of Messrs. Lott & Hart, of Faversham, one of which, a cock-bird, was mottled, one wing being entirely white, which made it very conspicuous, and on that account it was spared from being shot when it helped

itself to the cherries. In the early autumn it was lost sight of with regret, being often looked for during the winter, but was never seen; and it was thought that it had fallen a prey to some one who had the propensity for putting into a glass case every bird that had the misfortune to differ from its fellows. But in the spring of 1877 it reappeared, and either found or brought a mate with it, and built a nest in the garden, where it remained all the summer, being the only bird that held the royal prerogative of helping itself to the fruit with impunity. In autumn the bird was again missing, and it was thought that it had come to an untimely end; but on the evening of March 4 it again made its appearance, and, perching on a fruit tree quite close to the house, it made the inmates aware of its presence by singing its evening chorus with all its might. It would thus appear that the blackbird does not stay in the same neighbourhood all the year. Do they pass south for their winter quarters like the ring-ousel, which we see passing southwards in the early autumn? these stay with us for one day, helping themselves to the mulberries, of which they seem very fond, and then are seen no more.—*James Pink.*

PRESERVING REPTILES.—I should be much obliged if you could give me any good way of preserving reptiles, more especially frogs and newts. I have read that, if put in a bottle of corrosive sublimate and spirits of wine, it takes them a long time to die, and they are in great agony all the time. By stating, first, how to kill, and, secondly, how to preserve, you will oblige—*Alfred Wheldon.*

STUNG OR SCALDED BY PARSNIPS.—I was surprised a few weeks ago to receive a note from the Island of Guernsey, from which I quote:—"I have been poisoned round my wrists, so that I could not write. You must know that parsnips collect quantities of dew, and if we touch, or are touched by, the most minute point of a leaf while the dew is on it, a red spot comes, which brings intolerable itching, especially when warm in bed; then each spot turns into a nasty yellowish blister full of very hot water. When that bursts, it leaves an open sore, as painful as a boil, which takes a long time to heal, and which continues itching till quite dried up." And in answer to an inquiry from me: "Only when wet with dew will they sting or blister; rain does not do it. Every farmer or agricultural labourer in the island has suffered from it." I may just add immense quantities of parsnips are grown on the island for the cattle, the soil being peculiarly suited to them. As I have not seen this stinging or "scalding," as it is called by the workmen, I should like to ask your readers if it be commonly met with in England, or is it peculiar to the island?—*Spes non Fracta.*

POSITION OF YEW IN CHURCHYARDS.—Has it been noticed that, as a rule, yew-trees in churchyards are on the south of the church? In twenty churchyards in East Surrey I find there are only two or three yews out of about forty that are north of the centre line of the church. I should be much obliged if any of the readers of SCIENCE-GOSSIP living in Surrey would inform me which churches in their neighbourhood have yews and which have not, especially to be informed certainly that the South London parish churches have none, as this would save me much unnecessary trouble; also of any traditions or reasons why they should be planted in churchyards.—*E. Straker.*

DEVELOPMENT OF FROGS' SPAWN.—On March 20, at 9 A.M., I collected some fresh spawn (there

was none on the previous evening), and placed it in a vessel out of doors. On the 24th, I brought half my collection into a greenhouse, temperature about 50° Fahr. On the 30th, the tadpoles in the greenhouse were free of the albumen, while those out of doors, after being several times under ice, were nearly all free on April 7.—*R. B. C. (Ware).*

CATS AND RABBITS.—It does occasionally happen for the cat to give suck and bring up rabbits. A few years ago I got three young rabbits, at the time my cat's kittens were destroyed, when the youngsters were put into the basket beside the cat. She, by all appearances, was pleased with the change; in a short time they were sucking. I kept them about nine months, but had to part with them, owing to their mischievous propensities. Last year a farm servant in the neighbourhood of Kelso got two young rabbits. The cat having kittens at the time, the rabbits were placed as a substitute for the kittens. The cat took well with the change; the rabbits, when they got older, became so mischievous that they tore everything tearable that came in their way. They were taken to a rabbit burrow a considerable distance off, but the old cat succeeded in finding them out and conducting them safely back to their cottage-home. There are authentic cases on the Borders of the fox-terrier taking a liking to kittens, and even beating off their own mothers, and the collie-dog nursing young pigs.—*R. R. Fans, Earlstoun.*

SUCCESSFUL BREEDING OF THE FOX MOTH (*Bombyx Rubi*).—In the months of September and October the abundant number of the caterpillars of this moth has often been observed. What with weather and other causes, few become perfect insects. For a few years back I have often tried to breed them, but was never successful till I took the following plan. I got a rough heather turf, sheltered it from the north and east winds, made a wood frame covered all over with thin cloth, and put thirty-six caterpillars into it in October, and in June I had the pleasure of seeing thirty-five perfect insects.—*R. R. Fans, Earlstoun.*

FAGUS, &c.—The "Fagus" of the Latins could not have been the chestnut, for this tree was known to the Romans by the name of *Castanea nuce*, it having been first found by them at Castanea, a town of Thessaly, near the mouth of Peneus.—*Mrs. Alfred Watney.*

NATTERJACK TOAD.—In reply to your correspondent, J. Perrycarp, I have kept a natterjack for a considerable time, and have never found it to emit any odour. Does he not mean the common snake, which, like most snakes, gives forth an offensive odour when irritated or under sexual excitement?—*J. M. Campbell.*

OUR BRITISH SNAKES.—The blind-worm does not "carry its young in a case in its back," the young being hatched shortly before they are brought forth. The adder is also ovo-viviparous, the egg bursting in the act of parturition. The ringed snake, on the other hand, is oviparous, leaving its egg to be hatched by the solar heat.—*J. M. Campbell.*

HOW LONG CAN A FISH LIVE OUT OF WATER?—I have on more than one occasion had proof of the tenacity of life in some fishes, particularly those of the perch family. Two instances are still fresh in my memory: one where a goldfish which had been taken from an aquarium had been left on a plate from six till twelve o'clock at night, and being again placed in the water swam about as vigorous as ever; the other,

a roach, had been kept four hours out of the water, with a like result on being replaced.—*J. M. Campbell.*

LATE SWALLOWS.—I find in Letter 21 of Gilbert White's "Selbourne," dated November 28, 1768, that one of his neighbours saw a martin in a sheltered nook, on a fine sunny day, hawking for flies; he also states he is perfectly satisfied they do not leave this island in the winter. It is singular that in the first week of this month in my garden I have seen several pairs of swallows busily engaged in their favourite pursuit of fly catching, although the nights were very cold; their numbers, however, dwindled down, and on November 27 last one pair only could I find in the district, and that pair about my garden. I saw them every day until the 12th. The night of the 11th was a very cold, frosty one. I found them in the morning sitting very disconsolately on the spouting of the dwelling-house, taking occasionally a short flight and returning to the same spot. I have never known the swallow (*Hirundo rustica*) so late before. It seems to me that Gilbert White is right in assuming that some of the flights are left behind.—*S. Griffin, Salisbury.*

INTELLIGENCE IN MAN AND ANIMALS.—From time to time we read in your journal anecdotes of animals, the writers of which suggest that they may be possessed of reason, in the sense that from two premises they draw a conclusion. The great difficulty in the investigation of the minds of animals appears to be that man instinctively and unconsciously, unless checked by reflection, explains their actions, especially in extraordinary cases, by his own modes and laws of thought. The dog, for example, is considered one of the most intelligent of quadrupeds, and numberless are the cases I have seen quoted to prove that he is possessed of reason; but in every instance it appears to me that though his actions might and would in the case of a man have been dictated by reason as above defined, it does not appear at all certain that such is the true explanation of the phenomena, at any rate it is dangerous, scientifically speaking, to attribute to reasoning powers what may perhaps have another explanation. I purposely refrain from quoting any of these alleged instances of reason in the lower animals, merely wishing to suggest the difficulties in the way of decision. If it could be proved that a dog deliberately chose one of two courses of action, the case of reason would be established. It is for his fidelity, attachment, and courage in defence of his master that the dog has endeared himself to man. In man's vocabulary these are called moral qualities, but in a dog they are not the result of choice and a distinction between good and evil, but are part of his nature, primal impulses (possibly affected by training) of which we know nothing; and it is as illogical to praise the dog for their possession as it would be to blame a magpie for secretiveness or a tiger for ferocity. There appears to be an impression that the intelligence of animals differs from man's only in degree. There is a difference between a beggar and a prince, says the old song, but this, however, is but one of degree; but until clear cases of reasoning are proved, and the numerous mysterious instincts of animals explained, surely are we not warranted in assuming that the intelligence of animals differs from that of man not only in degree but in kind?—*H. D. Barclay.*

THE "CHIFFONIER," OR "OLE CLO'" AMONG THE INSECTS.—I was amusing myself this last August in watching the habits of spiders and other creatures in the window, and on the broad window-ledge of an unoccupied apartment in a villa at Bellosguardo, near Florence, and collecting specimens for my microscope,

when I saw what, for the moment, I imagined was a little nest of spiders' eggs being blown along the ledge; but I perceived on closer inspection that the object was not the usual dainty little spider's nest, but a rather untidy, fluffy ball, about the size of a large pea, and that the object was steadily and rapidly moving along of its own accord, stopping now and then for a second and then resuming its journey. To my amazement, I then saw that the ball of fluff was borne on the back of a little insect, greyish-white, somewhat resembling the larva of the dermestes, and that the untidy but spherical mass was surely composed of cobweb, held on the creature's back by being twisted about in and out among the long projecting hairs which were on the upper surface of the body. The insect was about a quarter of an inch in length, and bore on its head a pair of forceps about the size of those borne by the common earwig, but for a totally different purpose; for, to my amusement, I noticed that each time the creature paused it was to pick up with these forceps some dead ant, or portion of a dead insect; legs, wings, scales of the common wood-louse, or crumb of a thorax dropped from some web after the meal of a spider; and these fragments were picked up so deftly, and in so droll a way did the creature turn its head round, and carefully arrange his treasure on his pack so as neither to lose it nor his balance; the movement was so cunning and so curious, that I was forcibly reminded of the chiffoniers in France and Italy, with their hook and their basket, and of the "ole clo'" and his pack in England. And, quoting Mr. Squeers, I involuntarily exclaimed, "Well, Nature's a rum-un!" and called my friend to watch the creature with me. For more than two days I kept it in a small glass-lidded box, supplied it with "ole clo'," and watched it constantly collecting and packing; but I never saw it feed, and one morning I found that a large ant I had supposed to be dead had attacked and eaten the creature, scattering the fluffy pack and its contents all over the box. Some weeks after this I received a note from a young friend at Vevey, who from my description recognises the "chiffonier," two of which, she says, "came towards me, on the table in the garden where I was seated reading, *collecting and packing* as you described." From my friend at Bellosguardo I also, on my return to England, received an account of one she had found, and of which she thus writes: "I had half a mind to send you one of those scavenger, or 'ole clo'" insects which Mr. P. found; but could not arrange anything that would insure its arriving alive. The pack on his back is much less choice than the others, consisting of parts of the bodies of dead flies, spiders' cobwebs, &c., while he himself is much smaller. I feel quite sure it is his food he collects, because the first night I put him under a tumbler he ate the wings of his fly, the only ornamental article in his collection. He is exceedingly fond of sugar, has eaten, I am sure, twice his weight, and has just added two small dead ants to his load, under which he staggers visibly. His pack is held on by long projecting hairs, and likewise secured and strengthened by cobwebs." Whether we have any "representative" insect chiffonier in England I do not know, but thought this little sketch of the insect might interest some of your readers.—*S. M.*

PEREGRINE FALCON.—It may interest some of the readers of SCIENCE-GOSSIP to know that a young male peregrine (*Falco peregrinus*) was shot at Moor Street, in this neighbourhood, on the 11th November, 1878.—*Roland Green, Rainham, Kent.*

SUPERSTITIOUS DISLIKE OF THE WREN.—In July's SCIENCE-GOSSIP a correspondent admits he

has occasionally met with instances of this superstition, but has always been unable to trace the reason for such an aversion. I may mention an old Irish tradition or legend, viz., that the Saviour, as alleged, withdrew Himself, and took refuge under a tree, desirous to be concealed, and the Robin carried moss and laid it over the tree, making the covering more dense, which so pleased the Lord that He blessed the bird, and putting forth His hand left the red mark on its breast; but the Wren came and carried away the moss, and so exposed His retreat, hence it is the "Devil's Bird."—*Wm. Lipsett.*

SPIDERS' WEBS.—Though I have often examined spiders' webs in all sorts of odd corners, I have never found any in cupboards where there was nothing for them to catch. In fact, in most instances the webs have had remains of flies, and especially moths, hanging about them. I, therefore, though agreeing with the opinion of your correspondent in the September number (the last clause excepted, which requires proof), think that the webs are also intended for the purpose of catching the semi-dormant moths and flies which retire into these dark corners. Moreover, the webs, though thicker and more closely woven, have always appeared to me quite as well adapted to their purpose as those anywhere else.—*An Observer of Spiders.*

THE EARTH-WORM.—Two or three days after reading the interesting article by Professor Paley, in SCIENCE-GOSSIP for June, on the habits, &c., of the earth-worm, my attention was attracted by the singular movement of the lower leaf of a geranium. Moving closer to it I found this was caused by a common lob worm, its hole being some distance from the leaf, it had to reach almost the whole extent of its body, catching hold of the leaf, it contracted its elastic body, until it had it almost within the mouth of the hole, but the leaf being still on the plant, it, of course, sprang back to its original position. This the worm attempted with great patience a number of times, but eventually finding its exertions of no use, it contented itself with a few pebbles, filling up the entrance with them, in the same manner as explained by Professor Paley.—*C. B.*

TENACITY OF LIFE IN A WASP.—Some time ago I made an experiment on the insect above-named in order to know something of sensation in the insecta. Securing a wasp, I severed the head from the thorax, and the thorax from the abdomen. In the thorax all motion seemed to cease in a few moments, but in the head vitality was maintained for several hours, and the motion of the tongue out and in alternately was performed with as much vigour as is usual to the creature, then it gradually ceased. The abdomen retained vitality for fully four days, and when touched would contract and the sting be protruded. This seems to me rather strange, as the abdomen is farthest removed from the cerebral ganglion.—*J. D. O.*

KESTRELS' NESTS.—Thinking it may interest some of the readers of SCIENCE-GOSSIP, I append a few notes of four kestrels' nests which lately came under my observation, showing a strange diversity in nesting habits for birds of the same species. The nests were—three of them placed in a fissure of a limestone cliff, some thirty feet from the ground—and the fourth among the stems of the thick ivy, which covered part of the rock. In two instances, however, no nest at all (in the usually-understood sense of the word) was made, the eggs, five in number, being laid on the scanty soil, which scarcely covered the rock. The third nest, though in an exactly similar position, was elaborately constructed of twigs and small roots, and

neatly lined with moss and wool, which was worked up with mud to a firm consistency. The fourth nest in the ivy was very roughly made, being, I think, an old jackdaw's nest "patched up," this last contained four eggs in the last stage of incubation. Directly under it, at about a yard's distance, was a nest containing five young jackdaws, and these continued unmolested by the hawk, sitting above them, till they were fully fledged.—*C. Candler.*

HOUSE-FLIES AND THEIR PARASITES.—A friend of mine, a few days ago, observed a common house-fly walking with apparently great difficulty and pain upon the counter of his shop. Taking a glass he looked closely at it and discovered that its lameness and pain were evidently owing to something upon one foot, which, however, he could not clearly discern, owing to the low power of his glass. Taking, however, the sharp blade of his penknife he pressed it upon what he thought was a growth from the foot, but the leg of the fly came off. This object he brought to his home, when we placed it under the microscope, at first under a small, afterwards under a high power, $\frac{1}{4}$ inch; we then discovered what a formidable creature it was, and could well understand the intense pain that poor little fly must have suffered, dragging with it, without any hope of shaking off, so fully armed a parasite. Its length I estimate about the one-twentieth part of an inch, its shape that of a bottle, its snout quite pointed, and its mouth filled with sharp teeth, which we could readily distinguish under the high power of $\frac{1}{4}$ inch. Its body was covered with apparently sharp bristles, it had four legs on each side, and near its snout a pair of most terrible-looking instruments exactly resembling the large claws of a lobster. Its colour was that of the leg, viz., dark brown. Certainly in all my researches I have never seen a more terrific-looking insect, and am not surprised at the fly being lame and in pain when within the clutches of so minute but so powerful an assailant. Have any of your readers noticed this creature, and can any one give me some information about it? Is it parasitic, or is it a foe of the fly, and only attacks it occasionally? I shall be exceedingly glad if any one of your numerous contributors can throw any light upon it.—*Rev. W. Marsdon Beeby.*

PIPING BULLFINCH.—While visiting in this neighbourhood a gentleman showed me a piping bullfinch, whose plumage during the last season has turned a complete dull black colour. The bird has moulted, but still it does not recover the variegations of its plumage; and, although a very clever piper, has not been heard to utter a note since the change came over it. The bird had been in the owner's possession for many years, so that no trick could have been played upon him. Can any of your readers account for this strange metamorphosis?—*St. Austell.*

PIPING BULLFINCHES.—M. E. M. H. would be much obliged if any one who has been successful in teaching a bullfinch to pipe a tune would give her his experience through these columns. She would particularly like to know what air he taught the bird, how long it took to learn it, and whether he was successful without a bird-organ?

SECOND GROWTH OF PLANTS.—Under this heading there are three notes in SCIENCE-GOSSIP for November on the second growth of various plants, and only one writer, D. Douglas, Leith, suggests that the late dry summer and the moisture of August "has probably something to do with the unusual abundance of these curious aberrations." The second growth is not confined to flowers, it extends to all

plants when their roots do not run deep; it may be seen in cabbages, turnips, and potatoes; the action is a natural consequence of the laws of nature. Every plant is a duct for moisture from the soil, under the great law of attraction; when this law has exhausted all the moisture from the surface soil and surface roots, the plant they belong to ceases to grow. If the season continues warm, and showers fall, the growth is renewed where it ceased, flowers develop more petals, daisies grow double, twigs shoot out fresh sprouts, and even farm roots in dry soils grow afresh in strange shapes. It would be a question if the seeds of the second growth could attain perfection in annuals if the wet weather commences early. I do not see that the action can have anything to do with evolution, the phenomenon does not change the order.—*H. P. M.*

TERATOLOGY IN A MOSS.—In an old quarry I recently found a stem of common *Polytrichum undulatum*, which had four setae, bearing capsules, springing from its summit.—*Young Muscologist.*

THE CRYSTAL PALACE AQUARIUM.—Mr. Gardiner, the secretary of the Crystal Palace Company, in speaking of the admirable manner with which their aquarium has been worked by Mr. Lloyd, says: "Our sea-water is now more brilliantly clear and healthy than it was when we obtained it, eight years ago; our animals (mostly those which we at first collected, and of great number and variety,) are in excellent condition; and we have never had occasion to clean any of our tanks, &c., the labour saved thereby, and the avoidance of disturbing the creatures, being very great. We never remove any excrementitious matters, large as is the quantity of food which the creatures eat, nor do these substances accumulate. They all are got rid of, or consumed chemically, as fast as they are formed. Naturally, we doubted the practicability of gaining these excellent results before we saw them attained, because no similar aquarium had before been erected in this country. Mr. Lloyd is now prepared to make a further and important improvement, in the direction of manufacturing sea-water for aquarium purposes, instead of sending for it from the sea. He made, and used, such water, with success, as recorded by him in print, more than twenty years ago, even when he had not succeeded in dissolving some of the ingredients of which actual sea-water consists. However, I have no reason whatever to doubt what he now says of his having succeeded in incorporating these things which he before left out, and that what he can now produce will be, not merely an imitation, but an absolutely identical mixture. I have to add, that, in obtaining water from the actual sea, unless a further and serious expense is incurred of going far out from the shore for such water, it is scarcely possible to obtain it clear, in large quantities, and in a given time, from near any coast, and consequently it arrives inland much contaminated with decaying organic matters, which have to be removed before the water can be used. Here this cause occasioned us some months of loss of valuable time before we could open our aquarium. But in using artificial sea-water clearness and purity can be obtained from the very beginning."

SEA ANEMONES IN AQUARIA.—Our treatment of *Tealia crassicornis* was of the simplest, as the specimen we kept for the unusual length of three years was merely placed in the aquarium with the rest of the anemones, occasionally fed with a bit of raw meat or mussel, and the tank frequently syringed. If "W. H. C." could succeed in finding one on a separate stone, or in knocking off a piece of the stone with

chisel and hammer he would insure its base being uninjured. I found some magnificent specimens at Scarborough last summer, and perhaps some of your readers can inform me whether cats are partial to such things, for I brought them home, and one night, thinking they would be benefited by a "low tide," I placed two (one was a splendid fellow, the size of a small plate) on a pane of glass on the floor. The next morning every trace of them had vanished. Our cat was *believed* to be out all night, but this is not positively known. Has any one ever heard of cat or dog eating a sea anemone? It may interest some collectors to know that I succeeded in getting about twelve varieties at Biarritz this spring; and, what is perhaps more wonderful, they nearly all reached England alive, and are even now in first-rate condition. When it is considered that the unhappy creatures made a tour of ten days with us after leaving the sea-side, and had to endure a daily packing and unpacking, spending a few hours in a tin box, and at night placed in a basin and just covered with a little water carried with us in a bottle, their constitutions cannot be called delicate, especially as the last journey was taken in a paper bag! One bay at Biarritz was perfectly carpeted with the lovely *Anthia cereus* of every hue, and it was a matter of difficulty to walk; but in spite of all our exertions, we never could get them to live two days. I know not why. We also found a beautiful specimen of the *Holothuria* or sea cucumber, and of a tiny bright blue and orange snail-like creature, which the sailors said was a sea-leech. Are these rare? We could not bring them with us to England for want of space. I would only add *in re Tealia crassicornis*, that unless the tank is a large one, a single specimen is enough to keep.—C. E. R.

METROPOLITAN SCIENTIFIC ASSOCIATION.—The twelfth session of this society was commenced on October 22, when the president delivered the usual introductory address to an appreciative audience. The president mainly confined himself to the subject of Light and its analysis, and gave an exposition of the successive advances made in this branch of research from the earliest to the more recent times. On concluding, a cordial vote of thanks was passed, and an adjournment made to November 26, when Mr. A. P. Holden read a paper on "The Sun-spot Cycle in relation to Magnetic and other Disturbances." The M. S. A., which was established as long ago as 1866, has steadily progressed to the present time, when it is now permanently settled in the city. Meetings are held the third Tuesday in each month at the ward schools, Aldersgate Street, E.C., and the society invite visitors to any of these meetings. Mr. C. Judd, A.K.C., F.R.A.S., is president, and Mr. W. West, of 9 Ackerman Road, Brixton, S.W., honorary secretary. Amongst the other officers are many well-known microscopists, whose papers have appeared several times in our columns.

CORNUS SANGUINEA.—Owing to the warmth and moisture of the few weeks in the beginning of winter which produced almost the conditions of a second summer, the *Cornus sanguinea* of this neighbourhood came out into full blossom for a second time last year. The flowers which are on last season's wood were in no way different from those that blossomed on the same plants last June and July. Is this unusual?—J. S. Luton.

STARLINGS AND LARKS.—The starling has often been held up as a bird of immaculate character. I am therefore sorry to state that I have last season observed him plundering red currants as diligently as his neighbours, the blackbird and the thrush. He has

also a taste for cherries. Still the benefits which he confers are vastly greater than the injury which he occasions, and I much regret that, to please such sapient bodies as the London gun clubs, he has been excluded from the protection—such as it is—of the Wild Birds' Preservation Act. The skylark is also a corn-eater. I have seen him distinctly at a very short distance hard at work in an experimental plot of wheat. It is remarkable, as a proof of the intelligence of birds, how soon they detect the harmlessness of a scarecrow, and how often such devices have to be changed if they are really to protect fruit or grain. The gardener in charge of the experimental plots above-mentioned tells me that nothing is of much use for more than two days.—J. W. Slater.

SEA ANEMONES.—In answer to your correspondent's ("C. E. R.") queries respecting sea anemones, I have no special treatment for *Bunodos gemmacea*; I have also found them very difficult to keep. The two I now possess have been in my tank nearly two years, and are the survivors of five I had from Torquay (one being the parent of the young ones mentioned in my notes on page 191); the other three dwindled away, as described by "C. E. R." at periods varying from three weeks to six months. With reference to feeding the young ones (which I do once a week), I found it a very difficult matter at first, but it is to be managed with patience and care. The method I adopt is as follows. I remove the young "ferns" into an old-fashioned wine-cooler holding about a quart of water, and keep them in a quiet place, where they get a tolerable amount of light; visit them several times on feeding days, and when I find any of them open, I drop a *very small* piece of mussel into the water and guide it gently with a thin piece of stick until it drops on the expanded disk, when it is soon devoured; if the first piece happens to miss the disk, I try a second or third, and so on until all are fed, when I syringe the water, which brings the pieces not eaten to the surface, and they are then easily removed. I find, after a few weeks of this treatment, the young ones feed readily off a stick the same as the full-grown ones, and I then put them back into the tank. I have also reared *B. gemmacea* and *S. bellis* in one of my aquaria, which is a glass fern dish (16 in. diameter), having a rim about 1½ inches from the top, on which rim I place the young anemones, where they are easily fed with a stick, being only just covered with water. I have now in my tank several young *S. miniata* and *Dianthus plumosus*, produced by spontaneous division, in a very flourishing condition.—C. A. Grimes, Dover.

A WHITE ROOK.—While walking in the neighbourhood of Dursley, in October, I noticed, at a distance of a quarter of a mile or more, a white bird walking in a ploughed field among a large number of rooks. Taking it to be a sea-gull, I approached the field, and found that the bird in question was a rook without a single dark mark on any part of its plumage, as far as I could discern at about a gunshot off.—C. W. Carrington.

TESTACELLA HALIOTIDEA, &c. IN NOTTS.—Perhaps it may interest the readers of SCIENCE-GOSSIP to know that *Testacella haliotidea* has been taken in this county. I have taken four specimens, and seen others, from which I conclude it has established itself here. I believe, from inquiries I have made, that this is the first time this species has been recorded from Notts, if not as far north as here; and probably it has been introduced with herbaceous plants at some time. Mr. Tate, in his "Land and Freshwater Mollusks of Great Britain," says: "This species is found in

kitchen and market gardens around London, Norwich, Gloucester, Taunton, Bristol, and in several localities in Devonshire, Tenby, and in the Channel Islands"; and Mr. Jeffrey's localities are much the same. I think it not improbable that this, like some other introduced species, will become more widely distributed throughout the country, as it seems to be gradually gaining ground, and its principal food is so universally distributed. The first specimen I discovered was devouring a large earthworm, and when I took it in my hand, it did not relax its hold. A few other somewhat rare shells were found by Mr. Musson, the secretary of the Nottingham Naturalists' Society, and myself a short time ago; we spent a day collecting on the Notts side of Pleasley Vale, near Mansfield, and another on the same side of Creswell Crags, of geological fame. In the former place, amongst numbers of commoner species, we found a few *Cochlicopa tridens* (*Azeca tridens* of Tate), one specimen of *Clausilia laminata* (dead), and several of *Helix lapicida*, in the same condition, but a living one we could not find. However, in the latter place we found one, but only one, alive; a long search rewarding us with about half-a-dozen more dead ones. I believe these, or part of them, are additions to the Notts fauna. In the afternoon we spent some time in one of the caves, known as "Mother Grundy's Parlour"; and besides a number of pieces of bone, we found three canine teeth of the hyena, and a molar tooth of some animal we could not determine. Since then I have found one specimen of *Limax brunneus*, a somewhat rare species, according to Tate, but it has a very distinct appearance, although so small. I think Notts will bear a much closer investigation than it has at present received, at least the northern part of it; and, doubtless, other species would be brought to light. The list of mollusca found in the county at present is about eighty; and probably a list may be prepared before long.—*R. A. Rolfe, Welbeck, Worksop.*

MODERN ZOOLOGY.—Some few weeks there appeared in one of the daily papers a prolonged correspondence on the sanitary value of the Eucalyptus, which ultimately degenerated into a discussion on the grammatical accuracy of scientific nomenclature. One of the writers, speaking of an opponent, asked, "Does he not know that the scientific names of the lion, dog, and panther respectively are *Felis leo*, *Felis canis*, and *Felis pardus*?" *Felis canis* the scientific name for the dog! I waited, expecting that a blunder so gross would be at once pointed out by some of the disputants, but no notice was taken. Is not this a striking proof of the great ignorance of biology which exists among the "intelligent and educated classes"?—*S.*

DEPTFORD PINK.—It may interest your readers to know that a fine specimen of the Deptford pink (*Dianthus Armeria*) was found in the parish of Creeting, near Needham Market, Suffolk, last summer.—*T. E. L., Creeting.*

BLACKBIRD AND THRUSH.—Mr. Kerr, in his article on the *Turdus viscivorus*, says that I have fallen into a singular mistake, and that the eggs with claret markings were undoubtedly those of the missel thrush. First, the eggs I saw were pale blue, speckled like a blackbird's and spotted with the deep claret markings of a song thrush as well. If the claret spots could have been rubbed out, the eggs would have been like handsome specimens of the *T. merula*. Now the eggs of the *T. viscivorus* are invariably either of purplish-white or very palest sea-green ground with surface spots and blotches of reddish-brown and underlying markings of faded

purple. In eight or nine nesting seasons I have not seen one egg with "deep claret markings"; also the eggs of *T. viscivorus* are considerably larger than those of *T. merula*. Mr. Kerr also says I must have mistaken the bird I saw (*T. musicus*) for *T. viscivorus*. Well, the size of the latter (as he says himself) is quite a sufficient distinction, irrespective of the different and deeper brown of the former; and as I saw the bird within a few feet of me, both sitting and flying round me, I could not have made the mistake he thinks I have. Now if I had been mistaken (and I am quite sure I was not), the circumstance would not be the less peculiar, for, instead of *T. musicus*, *T. viscivorus* would have been mating with *T. merula*, for I saw (as I stated) *T. musicus* and *T. merula* together. Again, as to the nest, I confess I was much at fault for not describing it. The outside was rather roughly constructed of mosses interwoven with grasses, and the lining was grass cemented with mud. Also, as Mr. Kerr says, the missel thrush is an early breeder, builds high, and prefers the fork of a tree for the site of its nest. Now this was in the middle of April; the nest was not above 6 feet from the ground, and was built in a hedge, and there are plenty of trees all round in which it (if it had been a missel thrush) would certainly have preferred to build. He also says no instance has been known of a hybrid between *T. musicus* and *T. merula*. Since my first notice, I see that Mr. Dresser, in his "Birds of Europe," mentions two or three instances: one on the authority of Count Salvadori, another on that of Mr. Wier, one of Macgillivray's able correspondents. He also says there is a hybrid in the British Museum. I think that Mr. Kerr has not carefully read my notice, or he would have seen that I did not take one egg, but rather intimated the reverse. At the same time I must not close without thanking him for kindly asking me to send him an egg for identification; but I was not in any doubt as to what the eggs were, and having a considerable number and not too much room, I never take one unless I absolutely want it.—*G. T. B.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

S. M.—Send us the papers you enumerated.

W. RICHARDSON.—You will find our answer to your query as to "fins" in your specimen of trilobite in the September number of SCIENCE-GOSSIP, 1878.

J. R. NER.—The following are good practical students' books on geology:—"Geology," by J. Clifton Ward; "Field Geology," by W. H. Penning (in both of these you get instructions as to mapping, &c.); Woodward's "Geology of England and Wales," and Kinahan's "Geology of Ireland." Richardson's is too old now. The second edition of Hooker's "Student's Flora of the British Islands" gives the critical species of British plants.

RITA V.—Your specimens are:—No. 1. *Carduus pratensis*, Huds.; No. 2. Restharrow (*Ononis spinosa*, L.); No. 3. Knapweed (*Centaurea nigra*).

W. L. B. (Pulborough).—A reply will be sent per post.

E. F. C. (Leicester).—First, names of plants, kindly sent for identification, are as follows:—No. 1. A variety of *Geranium pusillum*; No. 2. *Myriophyllum verticillatum*, L.; No. 3. *Ranunculus pseudofluitans*, N.; No. 4. *Ranunculus Lenormandi*; No. 5. *Ranunculus trichophyllus*, Chaix; No. 6. *Ranunculus floribundus*, Bab.; No. 7. *Callitriche pedunculata*, D. C.; No. 8. *Potamogeton graminicus* (?); No. 9. *Juncus* (?); No. 10. *Juncus bufonius*; No. 11. *Eranthe fluvialis*, Col. (?), not perfect specimen; No. 12. *Chara flexilis*; No. 13. *Galeopsis versicolor*; No. 14. *Trifolium medium*; No. 15. *Plum-*

bago Coronopus, L.; No. 16. *Polygonum* (Could you send another specimen of this species?); No. 17. *Glyceria fluitans*, Sm. *Campanula patula* alba, is far from common anywhere. *Phanago lacustris* (Yes).

J. A. (Coventry).—Hooker and Arnott's "Flora" is superseded by Hooker's "Student's Flora"; by all means secure this.

R. A. H. (Glasgow).—Your specimens are:—No. 1. *Equisetum Telmateia*; No. 2. *Hieracium alpinum*, L.; No. 3. *Brya media*, L.; No. 4. *Poa alpina*; No. 5. *Festuca ovina* (?); No. 4 was a curious viviparous specimen.

J. FINNEMORE (Turro).—Smith's "Synopsis of the British Diatomaceae" is now a very scarce book. We received a catalogue from a Berlin bookseller who has a copy; the price is 92 marks, and Mr. Finnemore should make immediate application. This is the only complete work on the subject, but as it has been published nearly twenty-five years, the number of species have since been trebled. O'Meara's "Irish Diatoms," the first part of which was published above three years since, is useful; a copy may perhaps be obtained of the author, the Rev. E. O'Meara, Newcastle Rectory, Hazelhatch, Dublin. All other information is scattered through the "Transactions" of the Royal Microscopical Society, Quækett Club, Linnean Society, "Annals of Natural History," "Quarterly Journal of Microscopical Science," &c. The address of the German bookseller is R. Friedländer & Sohn, 11 Carlstrasse, Berlin, N.W.

J. A. KAY.—It is impossible to name your species of diatom from your rough sketch, and absence of description as to markings, size, habitat, &c. There are about fifty species of Navicula, of which it is one.

THE BOTANICAL EXCHANGE CLUB.—To save personal applications and inquiries, we beg to state that the parcels of return plants are being rapidly made up, and all subscribers who have not received them will receive them in a few days.

J. H. M.—Your specimen is a *Sisymbrium*; we should not like to speak positively as to species, though it may prove to be *S. Iræ*.

W. R. WELLS.—It is a somewhat thankless task to have to name an entomological specimen from a worn wing. But your moth appears to be *Bryophila glandifera*, a rather uncommon species.

EXCHANGES.

For half-ounce sand containing foraminifera (fossil) send good foraminiferous or diatomaceous material, or two stamps, to Geo. Clinch, Hayes, Kent.

WANTED, European Anodons and Unios in exchange for fine eocene fossils (British) or for N. American L. & F. W. shells, including many species of *Anodon* and *Unio*.—G. Sherriff Tyle, 62 Villa Road, Handsworth, Birmingham.

OFFERED *Colitis edusa* and other lepidoptera or birds' eggs for specimens of *Leucophasia sinapis*.—Herbert Ellis Norris, St. Ives, Hunts.

In exchange for books or natural history objects, the fine cast of a saurian from Lyme Regis, size 12 X 28. The matrix is the colour of lias shale and the bones coloured in imitation of the original, which is in Jernyn Street Museum.—Address T. C. Maggs, Yeovil.

WANTED, any of the following in exchange for twenty-eight parts of Sowerby's "English Botany"; Rossmässl's "Iconography," 3 vols., coloured plates; Jeffrey's "British Conchology," 5 vols., coloured plates; or an equal number of parts of the "Journal de Conchyliologie."—J. D. Butterell, 26 Colman Street, Hull.

ICHTHYOLOGY.—Any reader of SCIENCE-GOSSIP requiring any specimens (in spirits) for anatomy and other purposes who will write to me with a view to exchange can obtain a number of species according to the time of the year. Address, first instance, Alpha, care of A. Reynolds, 58 New North Road, London, N.

PREPARED slides of fossil wood from South Wales coal measures in exchange for other objects of interest.—W. H. Harris, 44 Partridge Road, Cardiff.

POLYDIA, fossil or recent, for exchange.—C. F. Ogilvie, Sizewell House, Leiston, Suffolk.

NINE good slides for polisher offered for SCIENCE-GOSSIP for 1876, unbound. Have a very large quantity of foraminiferous sand from sponge, and will send on receipt of stamped and addressed envelope, W. Wise, Broad Street, Lancaster.

Will give well-mounted slides in exchange for good 1/4 or 1/2 objective. Send description of objective, and I will send list of slides.—J. Horn, 5 Belle Vue Square, Scarborough.

WANTED, "Monograph of British Graphidæ," by Rev. W. A. Leighton, B.A., or Mudd's "Manual of British Lichens," 1861. Microscopic slides of lichen spores, &c. or other books in exchange.—Rev. W. Johnson, 19 Union Lane, Gateshead-on-Tyne.

SCIENCE-GOSSIP, 1873 (in fair condition, unbound), in exchange for fossils; or what offers?—W. H. B., 1 Percival Street, Long-sight, Manchester.

AMERICAN, African, Bermuda, European, British eggs, side-blown, authenticated, many rarities: Eleonora falcon, Rufus swallow, rock-thrush, *Turdus cyaneus*, Alpine chough, Cinereus vulture, Lesser cormorants, imperial eagle, &c., in exchange for others.—Sissons, Sharrow, Sheffield.

SLIDES of butterfly scales, garden white, small and large heath and common blue, for other slides.—W. R. W., 20 London Road, Carlisle.

BRITISH birds' eggs, side-blown, picked, labelled; well-marked specimens. List free. Also complete collection of British coleoptera, male and female specimen of every known British variety; 8000 specimens, artistically mounted on cardboard, without pins (new style); correctly named. Particulars sent. Exchange arranged by letter. Foreign correspondence solicited.—Henry Sissons, Westbourne Road, Sheffield.

WANTED, SCIENCE-GOSSIP for 1873, bound or loose. Must be in good condition. Will give well-mounted micro slides or cash.—F. Kellow, 94 Long Acre, W. C., London.

OFFERED, Scottish fossils and American lepidoptera. Wanted, fossils, brachiopoda, or fish-remains preferred.—T. Stock, 16 Colville Place, Edinburgh.

WELL-MOUNTED slides for exchange, including good foraminifera, animal hairs, &c.—J. Ford, Wood View, New Bridge Crescent, Wolverhampton.

FOR section of clematis, send well-mounted slide to Thomas Shipton, The Terrace, Chesterfield.

SIDE-BLOWN eggs for exchange (mute swan, carrion crow, magpie, sedge warbler, pied wagtail, and others).—James Ingleby, Eaststone, near Kipon.

In duplicate, about 100 different species of the British land and fresh-water shells, including well-authenticated examples of *Pertigo minutissima*, *P. alpestris*, *P. pusilla*, *P. substriata*, *P. angustior*, *Limnaea involuta*, *Succinea oblonga*. Desiderata: Good foreign land shells, Helices, Bulimi, Achatina, &c.; also *Isidium ruscum*, *P. obtusale*, *L. Burnetti*, *Pupa ringens*.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

SCIENCE-GOSSIP from January 1874 to December 1878, inclusive (three numbers missing); also "Nature" for 1876 (one part missing); both unbound, in good order. For objects, &c., or a parrot, or anything useful. Please send offers.—J. J. Macintosh, 47 Aylmer Street, Montreal, Canada.

I HAVE about a dozen splendid exotic butterflies, also many other natural history specimens, for disposal or exchange. Send for list.—"Science," 105 White Ladies Road, Bristol.

ANTHINA COMMUNIS (small), in exchange for *Isocardia Cor*, *Cytherea chione*, *Scalardia Turtonis*, or other rare marine slides.—J. W. D. Keogh, 25 Camperdown Place, Great Yarmouth.

OFFERED, infusoria, entomostraceans, crustaceans, isopod crustaceans, rotifers, sponges in spirit, fresh-water polypes, scales of young crocodile, sea-urchins, and spines and pedicellæ of sea-urchin and starfish, for specimens of small vertebrate animals or bones of such.—Leo, 144 Finborough Road, Earl's Court, S.W., London.

NORTH of Ireland beach and estuarine clay floatings and chalk flint powder, each rich in foraminifera, for good geological or microscopic objects.—Wm. Gray, Mount Charles, Belfast.

SLIDES of diatoms, hoofs, horns of animals, &c., well-mounted, for other well-mounted objects.—H. B. Thomas, 34 Montpellier Street, Montpellier Square, S.W., London.

QUANTITY of first-class micro slides of general interest well-mounted, and large assortment of unmounted material. Wanted magic lantern, 3 1/2-inch condenser and slides; photo apparatus, &c. All letters answered.—T. McGann, Burren, county Clare.

BOOKS, ETC., RECEIVED.

"Ramsay's Physical Geology and Geography of Great Britain." Fifth edition. London: E. Stanford, Charing Cross. "Flowers and their Unbidden Guests." By Professor Kirner. Translated by Dr. Ogle. London: Kegan Paul & Co.

"Wild Sports and Natural History in the Highlands." By C. St. John. London: John Murray.

"Six Months in Ascension." By Mrs. Gill. London: John Murray.

"South-Western Pennsylvania in Song and Story." By Frank Cowan, Greensbury, Pa.

"Proceedings of the Natural History Society of Glasgow. Vol. iii, part iii.

"Science pour Tous."

"Feuille des Jeunes Naturalistes."

"Canadian Entomologist."

"American Naturalist."

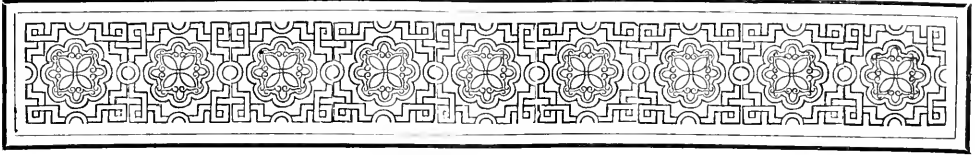
"Midland Naturalist."

"Land and Water."

"Chambers's Journal."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—T. S.—R. D.—W. G. S.—H. L.—J. H.—G. H.—E. S.—R. M.—E. C.—Dr. G. H. H.—L. C.—Dr. A. G. S. T.—S. M.—Dr. A. M. McCa.—J. B. E.—S. E.—J. G.—S. G.—A. S.—H. B.—A. H. S.—W. R. G.—Dr. H. F. P.—Professor B.—J. A. S.—C. E. R.—W. H. H.—E. M.—V. C.—F. C.—E. H. R.—J. D.—W. J.—A. W.—H. E. W.—J. D. B.—F. C. M.—J. W. B.—H. E. N.—J. A. W.—G. C.—E. L. M.—M. L.—A. C. C.—H. D. B.—J. R. N.—R. W. W.—T. R. J.—H. S.—J. M. W.—T. S.—J. F.—F. T.—F. W. H. R.—R. W.—F. C. K.—T. S.—W. S.—F. H. A.—J. I.—J. J. M.—E. T. S.—J. W. D. K.—W. G.—R. S. P.—J. F. R.—J. C.—H. B. T.—W. R. W.—J. W. S.—T. McG.—E. F. C.—&c.



“SCIENCE-GOSSIP” BOTANICAL EXCHANGE CLUB REPORT FOR 1878.



More than twenty-five working members during the past season have forwarded parcels for exchange. Most of the collections were small, though they were excellently preserved and labelled. We prefer, however, mentioning any novelty (with the locality where it was collected), although we feel bound to give any notes forwarded with the parcels when they

are of public interest. Thus, Mr. Cunnack, of Helston, writes :—

“*Lavatera sylvestris* : without doubt wild on Tresco, St. Agnes, and St. Mary’s, Scilly Isles, especially on the first-named. *Valerianella carinata* : very plentiful near the town of Helston. *Mentha pubescens*, Willd. : authenticated by Dr. Syme. Plentiful in the corner of a damp meadow near Pengersick Castle, in the parish of Breaze, about five miles west of Helston. *M. sylvestris* is particularly abundant close to it. Two forms of *M. pubescens* were observed, one spicate, the other a subspicate form. *Echium violaceum* : in great plenty in fields near St. Just, West Cornwall, one where potatoes had been planted being full of it, presenting a beautiful appearance. There were thousands of specimens in full flower. There seems no reasonable doubt of its being a native. *Juncus capitatus* : very plentiful this year near Caerthillian Valley, extending to Gue Graze Valley, about a mile and a half distant.”

Mr. King, of Edinburgh, also notes :—“*Symphytum tuberosum* : a somewhat local plant in the neighbourhood of Edinburgh, where we gathered the specimens sent on the banks of the Braid Burn. The plant is

plentiful on the shady side of the rivulet ; on the opposite bank we saw not a single specimen. On the banks of the Water of Leith, near Bonnington, we have gathered a stray plant, mixed with the butterbur and other coarse plants. *Lolium temulentum*, Linn., is another local species in our neighbourhood, and about Leith, waste ground in proximity to the docks, and adjoining sea-beach, this plant is found less or more for these three years back. In the month of July, I found a single clump on the banks of the Firth of Forth, about one mile west from Granton. The variety *arvense* I have not collected previous to the past summer. *Carex pendula*, Linn. : on the railway bank near Trinity, where I gathered this plant, the soil is poor and wet, the rusty water oozing out in all directions. *This sedge favours a soil containing compounds of iron.*”

Mr. A. Brotherston observes several good things, as follows :—“*Salix Russelliana*, var. : very near, if not quite, *fragilis* on the one hand, to *alba* on the other ; apparently it is a hybrid between these two. The male, which was unknown to Sir J. E. Smith, is not uncommon in this district. *Ranunculus fluitans*, var. *Bachii*, Wirt. : Tweed, near Kelso, and Teviot near Roxburgh Castle, July, 1878. I send a few specimens from four different plants, some of them with well-developed floating leaves. Though perhaps not typical *Bachii*, they are nearest that form.”

We were glad to be able to distribute this valuable specimen to all our members. We trust they will study it carefully ; perhaps some of them may be able to note other characteristics. Also, a few carefully selected examples of what we suppose to be *Salix ambigua*, Ehrh., are sent out. Is not *S. ambigua* a variable hybrid betwixt *S. repens* and *S. aurita* ? These specimens are for comparison with others.

Pieris hieracioides, var. *arvensis* : Tweedside, near Kelso, June, 1878. Probably introduced with grass seeds. *Carex Watsoni*, Syme : Tweedside, Makers-town, Roxburgh, June, 1878. Plentiful many places on Tweedside, occurring in long narrow beds close to the edge of the river. *Potamogeton pectinatus*, L. : Teviot, near Kelso, Roxburgh, July, 1878. This is a common species on the borders.

Mrs. Edwards finds *Eranthis hyemalis* in a wood at

Subbery, on the borders of Derbyshire, "probably introduced to this locality." Also *Crocus nudiflorus*, from a hilly pasture in the village of Walstanton, Salop. "We have it from several localities this season, in fact from all the neighbouring counties."

Amongst the novelties which will be doubtless highly valued by all our contributors are the following:—*Ruppia spiralis*: Bospham, Sussex. Coll. Rev. F. H. Arnold. *Mentha pubescens*: by a rivulet, Pra Sands, West Cornwall. Coll. W. Curnow. *Thalictrum flexuosum*, Bernh.: cut from plants four to five feet in height, growing in an exposed situation at Bala Lake. Coll. C. Bailey, F.L.S. *Seseli Libanotis*: Cuckmere, near Sleaford, Sussex. Coll. H. E. Wilkinson. *Savothamnus prostratus*: Lizard Point, Cornwall. Coll. J. Cunnack. *Trifolium Townsendi*: St. Martin's, Scilly Isles. Coll. W. Curnow. *Zostera nana*: river Tamar, East Cornwall. Coll. W. Curnow. *Lavatera arborea*: Tresco, Scilly Isles. Coll. W. Curnow. *Orobancha rubra*, Sm.: Lizard Point. Coll. W. Curnow. *Orobancha amethysta*: St. Mary's, Scilly Isles. Coll. J. Cunnack. *Orobancha amethysta*: St. Ouen's Bay, Jersey. Coll. J. Cosmo Melville, Esq. *Papaver somniferum* β . *glabrum*: Rosley, Cumberland. Coll. Rev. R. Wood. *Polygonum cognatum*: Westerley Ware, Kew. Coll. T. R. Sim. *Viola permixta*, var. *sepincola*: Merstham, Surrey. Coll. W. H. Beeby. *Cyperus fuscus*, Linn.: Pond-side, Shalford Common, Surrey. Coll. W. H. Beeby. *Potamogeton zosterifolius*: Spondon, Derby. Coll. Rev. W. H. Painter. *Callitriche obtusangula*: Mitcham, Surrey. Coll. A. Bennett, Esq. *Rumex maritimus*: Groby Pool, Leicestershire. Coll. E. F. Cooper. *Triticum acutum*, DC.: Leith, Edinburgh. Coll. D. Douglas. We have sent out a large supply of this species for our friends to compare with other herbaria specimens, the name being somewhat doubtful; many of the examples closely resemble *T. repens*, Linn.

We return our thanks to all members for the excellent manner in which the specimens have been got up. In some instances it is impossible by any other means to secure so valuable a rarity, for example, as the *Cyperus* mentioned above. Our best thanks, and those of the members, are also due to Mr. J. F. Robinson for acting as curator.

"UNGKA," APE OF SUMATRA (*SMIA SYNDACTYLA*); THE ANATOMY OF ITS LARYNX, ETC.

By Dr. GEORGE BENNETT, F.L.S. &c.

DURING a visit to the Island of Singapore, on the 13th of November, 1830, a male specimen of this interesting animal was presented to me. The animal had been recently brought by a Malay lad from the Menangkabau country, in the interior of Sumatra. The Malays at Singapore called this animal

the "ungka"; by Sir Stamford Raffles it has been stated as being called the siamang among the natives; and the ungka ape is described by F. Cuvier as the onko, in his splendid work on the Mammalia. On making inquiry among the Malays at Singapore, they denied this animal being the siamang, at the same time stating that the siamang resembled it in form, but differed in having the eyebrows and hair around the face of a white colour.

The *Simia syndactyla* is described and figured in Dr. Horsfield's "Zoology of Java;" but the engraving does not give a correct idea of the animal. The following sketches are taken from drawings made by Charles Landseer, Esq., from the original. My specimen was a young male. It is preserved in the collection of the British Museum.

I now proceed to relate the habits of the animal as observed by me on board the ship "Sophia," during the passage to England. The measurement of the animal was as follows:—From the os calcis to the vertex of the head, 2 ft. 4 in.; span of the arms, 4 ft.; length of the arm, from the axilla to the termination of the forefinger, 1 ft. 10½ in.; length of the leg from the groin to the os calcis, 11 in.; length from the xiphoid or ensiform cartilage to the crest of the pubis, 7½ in.

The teeth are twelve in each jaw; four incisors, two canine, and six molars: in the upper jaw the canine were placed widely apart from the last incisor, giving an appearance as if a tooth was deficient: this did not occur in the lower jaw. The teeth of the animal were in very bad condition. The colour of the animal is entirely black, being covered with stiff hair of a beautiful jet black over the whole body; the face has no hair, except on the sides as whiskers, and the hair stands forward from the forehead over the eyes; there is little beard. The skin of the face is black; the arms are very long, the radius and ulna being of greater length than the os humeri; the hair on the arm runs in one direction, viz. downwards, that on the forearm upwards; the hands are long and narrow, fingers long and tapering; thumb short, not reaching farther than the first joint of the forefinger; the palms of the hands and soles of the feet are bare and black; the legs are short in proportion to the arms and body; the feet are long, prehensile, and, when the animal is in a sitting posture (fig. 29), are turned inwards, and the toes are bent. The first and second toes are united (except at the last joint) by a membrane, from which circumstance he has derived his specific name. He invariably walks in the erect posture when on a level surface; and then the arms either hang down, enabling him sometimes to assist himself with his knuckles; or, what is more usual, he keeps his arms uplifted in an erect position, with the hands pendent (fig. 28), ready to seize a rope and climb up on the approach of any danger, or on the intrusion of strangers. He walks rather quickly in the erect posture, but with a waddling gait, and is soon

run down if whilst pursued he has no opportunity of escaping by climbing. On the foot are five toes, the great toe being placed like the thumb of the hand; the form of the foot is somewhat similar to that of the hand, having an equal prehensile power; the great toe has a capability of much extension outwards, which enlarges the surface of the foot when the animal walks; the toes are short, the great toe is the longest. The eyes of the animal are close together, with the irides of a hazel colour: the upper eyelids have lashes, the lower have none: the nose is confluent with the face, except at the nostrils, which are a little elevated; nostrils on each side, and the nose united to the upper lip: the mouth large: ears small, and resembling the human, but without the pendent lobe. He has nails on the fingers and toes; he has two hard tubercles on the tuberosities of the ischium, but is destitute of a tail or even the rudiments of one.

His food is various: he prefers vegetable diet, as rice, plantains, &c., and was ravenously fond of carrots, of which we had some quantity preserved on board. He would drink tea, coffee, and chocolate, but neither wine nor spirits: of animal food he prefers fowl to any other; but a lizard having been caught on board, and placed before him, he took it immediately in his paw, and greedily devoured it.

The first instance I observed of his attachment was soon after the animal had been presented to me by Mr. Boustead. On entering the yard in which he was tied up, one morning, I was not well pleased at observing him busily engaged in removing his belt and cord, at the same time whining and uttering a peculiar squeaking noise. When loose, he walked in the usual erect posture towards some Malays who were standing near the place; and after hugging the legs of several of the party, he went to a Malay lad, climbed upon and hugged him closely, having an expression, in both the look and manner, of gratification at being once again in the arms of him who, I now understood, was his former master. When this lad sold him to Mr. Boustead, whenever the animal could get loose he would make for the water-side, the Malay lad being usually on board the prau in which they had arrived from Sumatra; and the animal was never taken until, having reached the water, he could proceed no farther. On sending him aboard the ship, he on arriving, after rewarding his conductor with a bite, escaped, and ascended the rigging; but towards the evening he came down on the deck and was readily secured.

He is not able to take up small objects with facility, on account of the disproportion of the size of the thumb to the fingers. The metacarpal bone of the thumb has the mobility of a first joint; the form of both the feet and hands gives a great prehensile power, fitted for the woods, where it must be almost impossible to capture an adult animal alive.

Under the throat is a large black pouch, a continuation of the common integument, and very thinly

covered with hair: this pouch is not very visible when undistended: it is a thick integument, of a blackish colour and corrugated appearance. It extends from the under part of the chin to the throat, and is attached as low down as the upper part of the sternum, and is also attached above to the symphysis of the lower jaw; its use is not well known, but it is not improbable that it is an appendage to the organ of voice. Sometimes, when irritated, I have observed him inflate the pouch, uttering at the same time a hollow barking noise;* for the production of which, the rushing of the air into the sac was an adjuvant. The inflation of the pouch was not, however, confined to anger; for, when pleased, he would purse the mouth, drive the air with an audible noise into the sac; or when yawning, it was also inflated; and in all instances he would gradually empty the sac, as if he derived a pleasure from it. When the sac has been distended, I have often pressed on it, and forced the air contained within it into the mouth, the animal not evincing at the time any sign of its being an annoyance to him. When uttering the barking noise, the pouch is not inflated to the same extent as when he yawns. It has been stated in an American publication, that the use of the air-sac is for a swimming-bladder. It may be said in refutation (if the assertion is not too absurd to be refuted) that the animal being one day washed in a large tub of water, although much frightened, did not inflate or make the least attempt to inflate the sac. He is destitute of cheek pouches as a reservoir for food.

When sleeping, he lies along either on the side or back, resting the head on the hands, and seemed always desirous of retiring to rest at sunset; but would often (I suppose from his approximation to civilisation) indulge in bed some time after sunrise; and frequently when I awoke I have seen him lying on his back, his long arms stretched out, and, with eyes open, appearing as if buried in deep reflection. The sounds he uttered were various: when pleased at a recognition of his friends, he would utter a peculiar squeaking chirping note; when irritated, a hollow barking noise was produced; but when angry and frightened, or when chastised, the loud guttural sounds of *ra, ra, ra*, invariably followed. When I approached him for the first time in the morning, he greeted me with his chirping notes, advancing his face at the same time, as if intended for the purpose of salutation. He had a gravity of look and mildness of manner, and was deficient in those mischievous tricks so peculiar to the monkey tribe. In only one instance did I experience any mischief from him, and that was in his meddling with my inkstand: he had a *penchant* for the black fluid, would drink the ink, and suck the pens, whenever an opportunity offered of his gratifying this morbid propensity. He soon knew the name of Ungka, which had been given to him;

* When the barking noise was made, the lips were pursed out, and the air driven into the sac, at the same time that the sound was uttered, the lower jaw was also a little protruded.

and would readily come to those to whom he was attached when called by that name. His temper was mild, and not readily irritated; his mildness of disposition and playfulness of manner made him a universal favourite with all on board.

When he walks in the erect posture, he turns the leg and foot outwards, which occasions him to have a waddling gait and a bow-legged appearance. He would walk the deck, being held by his long arm, and then had a resemblance to a child just learning to walk. He has an awkward manner of drinking, by which the liquid is much wasted: he first applies his lips to the liquid, throwing the head up, which may in some degree be attributed to the prominence of the lower jaw; and if the vessel in which the liquid is contained should be shallow, he dips the paw into it, holds it over the mouth, letting the liquid drop in. I never observed him lap with the tongue when drinking; but when tea or coffee was given to him, the lingual organ was carefully protruded for the purpose of ascertaining its temperature. He usually (on first coming on board), after taking exercise about the rigging, retired to rest at sunset, in the maintop, coming on deck at daylight. This continued until our arrival off the Cape, when, experiencing a lower tem-

perature, he expressed an eager desire to be taken in my arms, and indulged by being permitted to pass the night in my cabin, for which he evinced such a decided partiality, that on the return of warm weather he would not retire to the maintop, but was always eager to pass the night in the cabin.

He was playful, but preferred children to adults; he became particularly attached to a little Papuan child who was on board, and who, it is not improbable, he may have in some degree considered as having an affinity to his species. They were often seen sitting near the capstan, the animal with his long paw around her neck, lovingly eating biscuit together.

She would lead him about by his long arms; and it was very amusing to see him running round the capstan pursued by or pursuing the child; he would waddle along at a rapid pace, sometimes aiding himself by his knuckles; but, when fatigued, would spring aside, seize a rope, and ascend a short distance, safe from pursuit. In a playful manner he would roll on deck with the child, displaying a mock combat, pushing with his feet (in which action he seems to possess great muscular power), entwining his arms around her, and pretending to bite; or, seizing a rope, he would swing towards her, and, when efforts

were made to seize him, would elude the grasp by swinging away; or he would drop suddenly on her from the ropes aloft, and then engage in various playful antics. He would play in a similar manner with adults, but always seemed to have a preference for children. If an attempt was, however, made by the child to play with him when he had no inclination, or after he had sustained some disappointment, he usually made a slight impression with his teeth on her arm, just sufficient to act as a warning that no liberties were to be taken with his person; or as the child would say, "Ungka no like play now." Not unfrequently, a string being tied to his leg, the child would amuse herself by dragging

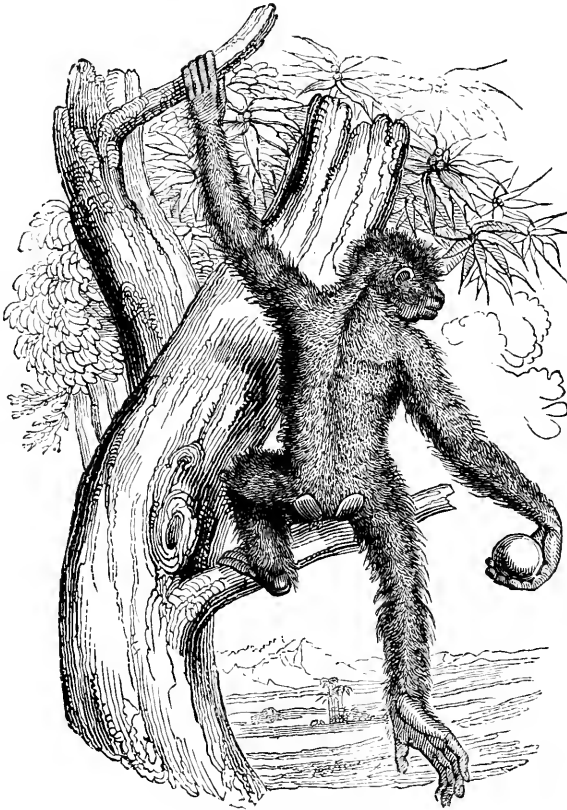


Fig. 27.—The Ungka Ape (*Simia syndactyla*) at home.

the patient animal about the deck; tired, however, of such practical jokes, without having himself any share in the fun, he endeavoured to disengage himself and retire; on finding his efforts fruitless, he would quietly walk up to the child, make an impression with his teeth on one of the members that were the nearest, soon terminate the sport, and procure his liberty.

There were also on board the ship several small monkeys, with whom Ungka was desirous of forming interesting "conversaciones," to introduce a social character among them, to while away the tedious hours, and to dissipate the monotony of the voyage;

but to this the monkeys would not accede, and they all cordially united to repel the approaches of the "little man in black," by chattering, and sundry other hostile movements peculiar to their race. Ungka, thus repelled in his endeavours to establish a social intercourse, determined to punish them for their impudence; when they again united to repel him, by chattering and divers other impudent tricks, he seized a rope, and, swinging towards the nearest, seized his "caudal appendage," and hauled away upon it, until the agility of the monkey obliged him to relinquish his hold. But it not unfrequently happened that he made his way up the rigging, dragging the monkey by the tail after him, and if he required both hands



Fig. 28.—Ungka Ape in erect position.

to expedite his ascent, the tail of his captive would be passed into the prehensile power of his foot. These ludicrous scenes were performed by Ungka with the most perfect gravity of countenance; having no caudal extremity himself, he knew he was free from any retaliation. As this treatment was far from being amusing to the monkeys, they afterwards either avoided him, or made so formidable a defence on his approach, that Ungka was obliged to refrain from indulging himself in "*tail-bearing*." He had, however, such an inclination to *draw out tails*, that, being obliged from "peculiar circumstances" to relinquish those of the monkeys, he cultivated the friendship of a little pig that ran about the deck, and, taking his tail in his hand, endeavoured, by frequent pulling, to reduce it from a curled to a straight form; but all his efforts were in vain; although piggy did not express any ill-feeling at his kind endeavours. On the din-

ner being announced by the steward, he invariably entered the cuddy, took his station near the table, and "scraps were thankfully received." If when once at dinner he was laughed at, he vented his indignation at being made the subject of ridicule, by uttering his peculiar hollow barking noise, at the same time inflating the air-sac, and regarding the persons laughing with a most serious look until they had ceased, when he would quietly resume his dinner. He disliked confinement, or being left alone; when shut up, he would display great ebullition of temper, but would be perfectly quiet when released. At sun-



Fig. 29.—Ungka Ape in sitting position.

set when desirous of retiring to rest, he would approach his friends, uttering his peculiar chirping note, beseeching to be taken into their arms: his request once acceded to, any attempt to remove him was followed by violent screams; he clung still closer to the person in whose arms he was lodged, and it was difficult to remove him until he fell asleep. His tailless appearance, when the back is turned towards the spectator, and his erect posture, gives an appearance of a little black hairy man.

The limbs, from their muscular and strong prehensile power, render the animal a fit inhabitant for the forest (fig. 27); enabling him to spring from tree to tree with an agility that we have frequently witnessed him display about the rigging of the ship;

passing down the backstays, sometimes hanging by his hands, at others by walking down them in the erect posture, like a rope-dancer, balancing himself by his long arms; or he would spring from one rope at a great distance to another, or would drop from one above to another below. Being aware of his inability to readily escape pursuit when running on a level surface, his first object, when about to make an attack, was to secure a rope, and swing towards the object he was desirous of attacking; if defeated, he eluded pursuit by climbing out of reach. He was very fond of sweetmeats, dates, &c.; some Manilla sweet cakes that were on board he was always eager to procure, and would not unfrequently enter the cabin in which they were kept, and endeavour to lift the cork of the jar: he was not less fond of onions, although their acridity would cause him to sneeze and loll out his tongue; when he took one he put it in his mouth, and ate it with great rapidity. He could not endure disappointment, and, like the human species, was always better pleased when he had his own way; when refused anything, he would display all the ebullitions of temper of a spoiled child, lie on deck, roll about, throw his arms and legs in various directions, dash everything about that might be within his reach, walk about, repeat the same scene as before, uttering during the time the guttural notes of *ra, ra*; the employment of coercive measures during the paroxysms reduced him in a short period to a system of obedience, and the temper was in some degree checked. He had not an unapt resemblance to a spoiled child, who may justly be defined as papa's pride, mamma's darling, the visitor's terror, and an annoyance to all the living animals, men and maid servants, dogs, cats, &c., in the house that he may be inhabiting.

The position of the feet, when the animal walks, is turned outwards, and the great toe, which has a capability of great extension, is spread out wide, giving a broader surface to the foot; when he walks, to use a nautical phrase, "he sways the body," and stepping at once on the whole of the under surface of the foot, occasions a pattering noise, like that which is heard when a duck or any aquatic bird walks on the deck of a ship.

When the weather is cold, he is seen huddled together, loses all his lively and playful manner, and sleeps much during the day: on the return of warm weather, it imparts life to the animal; his spirits revive, he resumes his gambols and sportive gaiety. Although every kindness was shown to him by the officers and crew, and sweetmeats were given to him by them, he would not permit himself to be taken in the arms, or caressed familiarly by any person on board during the voyage, except the commander, Mr. Hays, the third officer, and myself; all those, in particular, who wore large bushy whiskers he particularly avoided.

When he came at sunset to be taken into my arms,

and was refused, he would display a paroxysm of rage, but that being unsuccessful, he would mount the rigging, and hanging over the deck on which I was walking, would suddenly drop himself into my arms. It was ludicrous to behold the terrified looks of the animal, and half-suppressed screams, if his finger was taken towards a cup of hot tea, as if to ascertain its temperature. He would frequently hang from a rope by one arm, and, when in a frolicsome humour, frisk about, shut his eyes, and have a resemblance to a person hanging and in the agonies of death. When strangers came on board, he approached them at such a distance as he considered consistent with his ideas of safety. The only lady who had honoured him with her notice was one who came on board from a ship ("Euphrates") we spoke at sea; he evinced, however, no partiality to the gentle sex, and would not permit her to caress him: whether it was the bonnet, which was *à la mode* of 1828, or other portions of the lady's dress, that excited his indignation, I know not; but he was evidently not eager to become acquainted with her: as she appeared at first timid of approaching the animal, it may in some degree have occasioned the cunning brute to keep up the feeling.

On the 19th of March (1831) we had reached the latitude 45° 41' N. and longitude 24° 40' W.; the animal seemed (although clothed in flannel) to suffer much from cold, and he was attacked by dysentery: his attachment was so great, that he would prefer going on the deck, in the cold air, with the persons to whom he was attached, to remaining in the warm cabin with those whom he did not regard. On the 24th he became much worse, his appetite gone, and he had a dislike of being moved; the discharge from the bowels was bilious, mixed with blood and mucus, sometimes entirely of blood and mucus, with a putrescent odour: the breath had a sickly odour, mouth clammy, eyes dull and suffused; drank a little water occasionally, and sometimes a little tea; he generally remained with his head hanging on the breast, and limbs huddled together; he would, however, when yawning, inflate the pouch as usual. On the 29th we had prevailing easterly winds; and he was daily sinking until the 31st of March, when he died, in latitude 48° 36' N., longitude 9° 1' W.

On examination, the thoracic viscera were healthy; the spleen was healthy, of small size, and lobulated at one extremity; the liver was large and healthy, the difference in size between that organ and the spleen was considerable in comparison with the relative proportions of those organs in the human subject; the gall bladder contained a small quantity of dark, thick, and viscid bile; some of the mesenteric glands were enlarged, some being of a white, others of a dark colour. On laying open the duodenum, it was found to contain a quantity of mucus slightly tinged with bile; the colon and cæcum were full of liquid bilious feces mixed with mucus, and several ulcerated patches

on the inner surface, and a dark spotted appearance at others; the rectum also contained similar feces, but mixed with a curdy matter, and there were several large patches of ulceration on the inner coat, more particularly near the termination of the gut: the kidneys were healthy, on the right the capsula renalis was large, but none was visible on the left; the bladder was quite empty, the inner surface scarcely moist. The animal had been castrated, but the spermatic cord terminated in the scrotum in two small oval substances, rather larger than peas; the sacrum and os coccygis were similar to those parts in the human subject. The communication of the larynx was examined; the epiglottis was only indicated by a slight obtuse angular rising; the sacculi laryngis three-eighths of an inch in the long diameter, one-eighth in the short; their margins were well defined, continued forwards below the body of the os hyoides into a membranous sac situated internal to the external thick one. This animal has one common sac, and thus differs from the orang-utan, which has two; the lungs also differ from those in the orang-utan in being subdivided on each side, the right lung having three, the left two lobes, as in the human subject. The extremities of the bones of the animal were cartilaginous.

When at Achua, on the coast of Sumatra, the Rajah and suite came on board, and I amused them with some drawings, among others they recognised that of the Pearly Nautilus, but said it was seldom procured at this place, but was occasionally seen off the coast. They were not acquainted with the orang-utan of which I showed them the engraving in Abel's "China," but immediately recognised that of the ungka gibbon, which, they stated, was found in the forests of the interior of the island, but was very difficult to capture alive. As mentioned by the Rajah there must be great difficulty in procuring them alive, as since the one given me at Singapore, I am not aware of any specimen, young or adult, of this species of gibbon having ever been brought alive to Europe.

THE IVORY-NUT PALM.

IN 1843 Mr. William Purdie was despatched to New Granada to collect plants for the Royal Gardens, Kew. He was especially instructed to find a few special plants, one of which was the ivory-nut palm, of which he says:—"In a journey of 600 miles from Santa Martha to Ocana in New Granada, at the village of Semana, seventeen leagues from hence (Ocana), and near the great river Magdalena, I entered the mountains by the Paroquia del Carmen, and saw for the first time the ivory-nut palm (*Phyt. elephas macrocarpa*), called *Tagua* by the natives. The habit of this palm is to have little or no stem, what there is is decumbent; its habit is not robust. Old plants have from fifteen to twenty pinnate leaves,

which when full grown measure nearly twenty feet in length, of a delicate pale green colour, and very graceful in aspect; the pinnæ are numerous and linear, the whole leaf being similar to that of the date palm. The male and female flowers are produced on separate plants (dioecious). The female flowers are produced generally in six clusters from the bases of the leaves on short footstalks. The clusters are of an imperfectly rounded form, covered with strong protuberances, about an inch and a half long. The clusters are compactly united together, forming a nearly globose head, and on account of the style-like projections resembling the rigid hair of a negro it is not inaptly called *Cabeza del Negro* (negro's head). The heads lie close to the ground, each cluster containing four to five seeds. The seed contains at first a clear insipid fluid; it afterwards becomes milky and sweet, and ultimately hardens, and becomes the vegetable ivory of commerce. Each nut is about the size of a green walnut, and is covered with a yellow, sweet, oily pulp, which is collected and sold under the name of *Pepo del Tagua*, for one real (6d.) a pound at Ocana. A spoonful of it, with a little sugar and water, makes the celebrated *Chiche de Tagua*, said to be the most delicious beverage of the country."

The stem of the male plant is longer and more erect than that of the female, regarding which Mr. Purdie says: "I have at last had the good fortune to detect the male flowers of the ivory-nut palm, for which I long sought in vain. The singularity of its inflorescence is only equalled by its beauty. It differs from most other palms by having a double spathe; the central column is thickly set with clusters of male blossoms, and forms, when taken all together, a mass three feet long and four inches thick. Half is concealed within the spathe, from which the other portion projects in a gracefully recurved form. The fragrance is most powerful and delicious, beyond that of any other plant, and so diffusive that the air for many yards around was alive with myriads of annoying insects, which first attracted my attention, the denseness of the vegetation not permitting me to discern the blossoms at any distance. I had afterwards to carry it in my hands for twelve miles, and though I killed a number of insects that followed me, the next day a great many still hovered about it, which had come from the wood where it grew, which are dense and shady, and abound with snakes. The men I had with me found it necessary to dislodge them from the plants with a long stick before they approached them. We killed several, not particularly formidable in appearance, but deadly in their nature. A cross, decorated with flowers and a few loose stones, near one of the Tagua woods, marks the grave of a young man who died a few hours after being bitten by one of these snakes."

Mr. Purdie having sent abundance of seeds to Kew, many plants were raised, one of which in 1864 had

formed a decumbent stem about a foot in length, producing leaves 15 to 16 feet long.

Dr. Berthold Seemann, also a botanical collector for Kew, found the *Phytelephas* in abundance in Darien; he gives a very interesting account of it, which in all principal points agrees with the above.

J. SM.

HINTS FOR THE YOUNG MICROSCOPIST.

IT has often occurred to the writer of these few lines that it is a pity that so many practical dodges as must have been adopted by various microscopical manipulators should be lost, as it is to be feared they have been from time to time. Unless called out by queries, they seldom appear in the form of suggestions. Acting under this impression, the writer is led to call attention to two or three little arrangements which he has found very useful, hoping that others will follow the example.

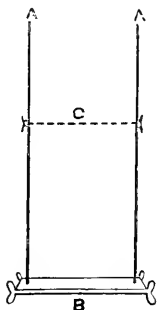


Fig. 30.—Brass stand to support the forehead whilst making microscopical drawings.

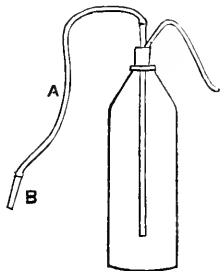


Fig. 31.—Improved wash-bottle.

In making drawings of objects seen under the microscope (for which purpose no apparatus is so satisfactory and easy to use as Natchet's prism or camera), most persons must be conscious that a steady *head* is as requisite as a steady hand. To insure this, a very simple plan (fig. 30) has been adopted for a long time by the writer. It is this:—two thin stair-rods (A, A) of any convenient length are fastened by one end into a stand of brass or wood (B), and just as far apart as to admit the head between them. Then there is a sliding flat bar (C), which can be screwed tight at any height. Round this is wrapped any soft substance, as lint or list, on which the forehead is placed just in the position desired. A steadiness and comfort are thus at once obtained which greatly assist the draughtsman.

Again, in using the wash-bottle the following little alteration will be found most convenient. (Fig. 31.) In place of having two glass tubes, one of which is placed in the mouth, let this mouth-tube be broken off an inch or two above the cork, and upon it fit an elastic indiarubber tube (A) of any convenient length,

say nine inches; then a couple of inches of glass tube put into the free end (B) makes a nice mouthpiece. The advantage is obvious, as this plan allows the head to be moved nearer to or farther from the object without interfering with the position of the bottle. This has been used by the writer for many years.

Other suggestions may follow if it is thought desirable.

Codicote Vicarage.

T. R. I.

THE BOULDER CLAY OF LEITH.

IT may interest your readers to learn something regarding the traces that have been left of the glacial period in this vicinity, which has proved to be a very interesting one in regard to that part of geological history.

Edinburgh is surrounded by an extent of country covered, more or less, with a thick layer of boulder clay. In most of the excavations in and around the city, this is reached after passing through the soil to an average depth of six to seven feet. To the south of the city, away on the first slopes rising towards the Pentland hills, the boulder clay is very thick, and forms a fine basin for the new reservoir in course of construction at Alnwick hill. From that point we can trace the clay to the north, through the Newington district of the town, where I have found it with the usual striated boulders. Passing through the city this deposit disappears on reaching the ridge which goes upwards towards the castle, till we approach Leith Walk, where it is again found. Some cuttings at Pilrig—the border-land between Edinburgh and Leith—have revealed the boulder-clay about seven feet from the surface. It is not, however, till we examine the shore at Leith that we get anything like a good section of it; and here both the mercantile enterprise of that town and the denuding power of the ocean, have come to our aid. As a result of the latter, the banks which rise against the sea between Leith and Portobello, are gradually giving way and receding, revealing the tough boulder clay, which seems to die hard in its battle with the sea.

When the boulders are found *in situ*, they are almost invariably lying with their longer axis from W. S. W. to E. N. E., and are striated in the same direction. This agrees with the striæ in Arthur's Seat, a hill rising to the east of Edinburgh and about two miles from the coast. I have found those boulders all along the coast from Cramond to Joppa, a distance of nine miles, but they are best seen between Leith and Portobello, where they lie thickly and where many of them have beautifully marked striæ. The ground here has been rendered geologically classic by the writings of Dr. Robert Chambers and Hugh Miller; the former however, attributing the phenomena in question to the agency of the sea

during the various changes of its level, while Miller detected in them the signs of a power now foreign to this country. When Miller worked here, the boulder clay was not so well exposed as it is now, and the examination is thus rendered much easier. Owing to the increase of trade at Leith, a new and very large dock is being constructed to the east of the town. In order to get a sufficient depth of water the sea bottom has been excavated, and this has laid open fine sections of the various deposits which have accumulated there.

The boulders are generally of greenstone; and

be made by one, who attempts for the first time, to track the knowledge of early botanists on any point, without some general knowledge of the subject-matter, *i.e.*, of the plants themselves. I propose making the British forms of *Thalictrum* the most prominent subject of my present investigation.

British botanists are looking forward with interest to the Guide to the Literature of Botany promised by the Index Society from the pen of Mr. B. Daydon Jackson, the accomplished editor of Turner's "*Libellus*" and Gerard's "*Catalogus*;" but, pending any better arrangement, I venture to divide the history of

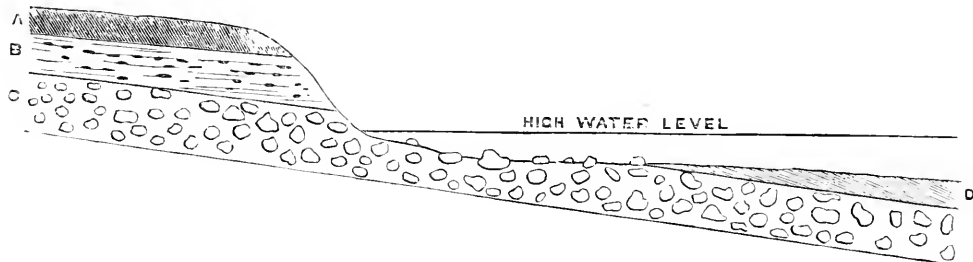


Fig. 32.—Section showing the boulder clay, &c. near Leith. A, surface soil; B, old sea-bed, with gravel layers; C, boulder clay; D, present sea-bed.

seem to have been carried from Arthur's Seat and the Corstorphine hill, some distance inland. So far I have not observed any of the west country rocks enclosed in the clay; but do not doubt that this is the track of the great glacier which, according to Geikie, had its origin away in the western highlands.

Since the deposition of the boulder-clay in this locality, the relative position of sea and land seems to have changed twice. The following diagram shows this; and also gives a general idea of the position of the deposit at Leith. On the top of the clay is found a thick layer of sand and pebbles, giving unmistakable proofs of marine origin, by the stratified order of the latter; while the boulder clay is once more raised above the bed of the ocean. A few hundred yards from the beach, the boulder clay disappears on account of the slight incline it takes towards the sea, and unless this is noticed, the sudden freeness of the shore from boulders is apt to confuse the geologist.

ROBERT HUMPHREY.

THE CRITICAL BOTANIST.

[THE HISTORY OF BOTANY.]

THE experience of recent years has clearly shown the great value of a historical or chronological method of research in nearly every branch of science. It may be well, therefore, in taking my own study of the genus *Thalictrum* as an example of critical method to give in considerable detail the materials as I have collected them. Every study must have a beginning, but many errors of interpretation will undoubtedly

British botany into four periods, the first terminating at the year 1670, the second at about the year 1746, the third at 1829.

Without going back to Solomon, or even to Aristotle and his pupil Theophrastus, who, born B.C. 371, described some 500 plants, classified as trees, herbs, and shrubs, I must just mention the name of Pedanius Dioscorides of Anazarba, in Cilicia, whose Greek work on *Materia Medica* is believed to have been written in the second century. It seems, however, to have been one of Pliny's main sources of information, and the author of the "*Historia Naturalis*," born A.D. 23, died in A.D. 79. After the time of Pliny it may truly be said, in the words of M. Crépín's excellent "*Guide du Botaniste en Belgique*"—a work well meriting an English imitation—"Avant le XVI^e siècle, la botanique ne peut être considérée comme une véritable science. Elle n'était que l'humble auxiliaire de la médecine; les plantes n'étaient pas étudiées pour elles-mêmes et les traités qui les concernaient n'étaient, pour la plupart, que des commentaires des ouvrages de Théophraste, de Dioscoride et de Pline." Though in the sixteenth century the Dutch may fairly claim the credit of possessing the most illustrious names in botanical science, Fusch, Dodoens, and L'Obel, we in England have reason to be proud of the early date (1538) of the first botanical work of "the father of British botany," William Turner. Turner was born probably between 1510 and 1515; his first work was entitled "*Libellus de re Herbaria Novus*," and has been reproduced in facsimile, and edited by Mr. Jackson; his "*Herbal*" was completed in 1568, the year of his death. Remacle Fusch, born at Limbourg, about 1500, died at Liège in 1587, his

various works, such as "*Plantarum omnium quarum hodie apud pharmacopolas usus est magis frequens nomenclature . . . sententiam*," Paris, 1541, being mainly *materia medica*. Rembert Dodoens was born at Mechlin in 1517, and died at Leyden in 1585. In 1554 he published his "*Cruydeboek*," which was translated into French by Clusius in 1557, into English by Henry Lyte in 1578, and into Latin, as the "*Stirpium Historiæ Pemptades*," by the author in 1583. "*La gloire de Dodoens*," says Crépín, "*est d'avoir rompu avec le passé, d'avoir, dans son histoire des plantes, étudié la nature par lui-même. . . . On peut dire, en toute vérité, que Dodoens est l'inventeur de la classification des plantes.*" His classification is, however, hardly worthy of the name. Conrad Gesner, born at Zurich in 1516, published a work, "*De Raris et Admirandis Herbis*," in 1555, but his great work, with figures of 1500 species, was not published when in 1565 he died, and his ideas on classification were carried out by Andreas Cæsalpinus, called by Linnæus "*Primus verus systematicus*." In his "*De Plantis*," published at Florence in 1583, he distributes 1520 plants into fifteen classes, his primary division being into trees and herbs, and the secondary ones according to the position of the embryo, and the nature of the fruit and seeds. In 1561 Valerius Cordus published Gesner's "*Historia de Plantis*," at Strassburg. Matthias de l'Obel, born at Lille in 1538, died at Highgate in 1616. In 1570, in conjunction with Peter Pena, he published in London his "*Stirpium Adversaria Nova*," and in 1576, at Antwerp, his "*Observationes*." His works were largely followed by John Gerard (born 1545), who, in 1596 and 1599, published catalogues of the plants growing in his garden, and in 1597 his "*Herball*." Gerard seems largely indebted to Dodoens, and seems to have little original merit. The "*Herball*" contains about 2000 plants. In 1601 appeared the "*Rariorum Plantarum Historia*," the chief work of Charles de l'Escluse, commonly known as Clusius (born 1526, died 1609). It was printed at Antwerp, "*par le célèbre Plantin, le généreux Mécène des botanistes*." In 1606 and 1616 was published at Rome the "*Ecphrasis*" of Columna, who alone seems to have appreciated the views of Cæsalpinus; for both Caspar Bauhin, in his "*Pinax*," in 1623, and his elder brother John, in his "*Historia Plantarum Universalis*," which describes 5000 species, follow Lobel. Pulteney describes the latter work, published in 1650, as "*a repository of all that was valuable in the ancients, in his immediate predecessors, and in the discoveries of his own time, relating to the history of vegetables, executed with that accuracy and critical judgment which can only be exhibited by superior talents.*" In 1623 Thomas Johnson (died 1644) published his "*amended*" edition of Gerard's "*Herball*," which is virtually a new work by an author far more critical than that of the original. A botanist of perhaps still higher calibre was John Parkinson, apothecary of London, and the King's herbarist, born

in 1567, who, in 1629, published a horticultural work, "*Paradisi in sole Paradisus Terrestris*," and in 1640 his "*Theatrum Botanicum*." The "*Phytologia Botanica*" of Dr. William How, published in 1650, "*The First attempt at a Flora in England*," and the "*Pinax*" of Dr. Christopher Merrett, published in 1666, are surpassed *longo intervallo* by the "*Catalogus Plantarum Angliæ*" of John Ray, which appeared in 1670.

Whilst the Catalogus opened a new period in British botany, a series of great works marked a fresh era in general botanical classification. These were the "*Historia Plantarum Universalis*" of Robert Morison, published in 1678, Ray's "*Methodus Plantarum*" in 1682, Rivinus's "*Introductio Generalis in Rem Herbariam*," in 1690, and Tournefort's "*Eléments de Botanique*," in 1694. Robert Morison, a native of Aberdeen, Regius Professor at Oxford, in his history, and in a previous work on the Umbelliferae, followed Cæsalpinus in looking to the fruit for his main characters; but so far as influence is concerned, Ray is the founder of a natural system of classification in England. He acknowledged his obligations to Jungius of Hamburg. His primary division was into Flowerless and Flowering Plants. The latter he separated into Dicotyledons and Monocotyledons, and he recognised the natural groups Fungi, Musci, Filices, Compositæ, Umbelliferae, Labiate, Boraginæ, and Cruciferae. In his "*Historia Plantarum*," completed in 1704, he describes 6000 plants, and in the second edition of the *Methodus* (1703), he classifies about 18,000, then known. His "*Synopsis Methodica Stirpium Britannicarum*," published first in 1690, was "*the first systematic Flora of Great Britain*." Of him A. L. de Jussieu wrote in 1719, "*Non a floribus tantum fructibusve, sed etiam a foliorum, caulium, radicumque tantum partium organicarum figura earumque colore, odore, sapore, et totius plantæ facie exteriori sumenda esse genuinæ methodi principia affirmabat.*"

Rivinus first insisted on the classificatory importance of the flower, especially eulogising Cæsalpinus and Ray. Tournefort first defined genera as now accepted; but in his classification he kept Theophrastus's old division into trees and herbs, basing his subdivisions entirely on the corolla. He distinguished the Compositæ, Scrophulariaceæ, Labiatae, Rosaceæ, Cruciferae, Umbelliferae, Caryophyllaceæ, Liliaceæ, Aménitiferae, Ferns, and Fungi; but the primary division renders his system far inferior to that of Ray. It, however, prevailed on the continent till the time of Linnæus, as did Ray's in Britain. Tournefort described 698 genera, including 10,146 species. Among British botanists of this period it will suffice to name Plukenet, Bobart, Buddle, Petiver, Sloane, Dillenius, and Blackstone. The "*Specimen Botanicum*" of the latter, Pulteney says, "*I consider as the last book published in England on the indigenous botany before the system of Linnæus had gained the ascen-*

dancy over that of Mr. Ray." It was published in 1746.

Carl von Linné, born in 1707, died in 1778. The first sketch of his artificial sexual system appeared in his "*Systema Naturæ*," published at Leyden in 1735, and it was further carried out in the "*Genera Plantarum*" (1737) and the "*Species Plantarum*" (1753), in which no less than 7294 species are defined. Linnæus's great services to botany were the establishment of the binomial system of nomenclature and of verbally-accurate and terse definitions. He required every species to be definable in twelve words. He adopted Ray's division of the vegetable kingdom into flowering and flowerless, coining the names Phanerogamia and Cryptogamia, and then divided phanerogams into twenty-three classes by the number and character of the stamens. These were mainly subdivided into Orders, according to the number of carpels. Linnæus himself only regarded this as a tentative system for practical purposes. "*Methodi naturalis fragmenta*," he writes, "*studiose inquirenda sunt. Primum et ultimum hoc in botanicis desideratum est. Natura non facit saltus. Plantæ omnes utrinque affinitatem monstrant, uti territorium in mappa geographica . . . Diu et ego circa methodum naturalem inveniendam laboravi . . . perficere non potui.*" I cannot refrain from quoting the following advice to the tyro from his "*Philosophia Botanica*" (1751), in which work he lays down the sensible rules, "*Descriptio ordinem nascendi sequatur*," and "*Descriptio compendiosissime, tamen perfecte, terminis tantum artis, si sufficientes sint, partes depingat.*" "*Tyro ignotas sibi plantarum species investiget ipse, secundum classes, characteres, differentiasque systematis.*

"*Principia et Fundamentum Botanices rite intelligat.*

"*Historiam literariam Botanices sibi familiarem reddat et imprimis auctores de speciebus plantarum consulendos. Synonyma auctorum, retrogrediendo ad inventores, evolvere adsuescat.*"

The "*Flora Britannica*" of Dr. (commonly called Sir) John Hill was the first work arranged on the new system in England; but, as Sir J. E. Smith said, it was the "*Flora Anglica*" of William Hudson, first published in 1762, that "marks the establishment of Linnæan principles of botany in England." A second edition appeared in 1778, the year of Linnæus's death. Sir James Edward Smith, who purchased Linnæus's herbarium and library, and was the main founder and first president of the Linnean Society, established in 1788, strongly, in fact, too strongly, supported the Linnæan system, adopting it in his "*Flora Britannica*" (1800-4) and in his "*English Flora*" (1824-8). In 1776 appeared the first edition of that very influential work, the "*Botanical Arrangement*" of William Withering; and it is most important for the student to note that Linnæus, Hudson, Withering, and Smith very fre-

quently meant very different plants when using one name. In 1777 William Curtis commenced the "*Flora Londinensis*," which he continued till 1798, the year before his death, and in 1787 he began the "*Botanical Magazine*." Sir James Smith in 1790 commenced the issue of "*English Botany*," illustrated by James Sowerby, and in 1807 Professor Thomas Martyn, in the ninth edition of "*Miller's Gardener's and Botanist's Dictionary*," may be said to have summarised the botany of his time with considerable attention to early authors.

We next come to the last of our four periods, that of the rise of the natural system—a period in which the growth of our knowledge of plants may be partially estimated from the facts that in 1819 Augustin De Candolle estimated the known species of phanerogams at 30,000, in 1839 Loudon enumerated 31,731; in 1846 Lindley gave 80,387, and in 1853, 92,920.

It is Bernard de Jussieu to whom belongs the glory of working out the true natural system, which he embodied in his arrangement of the Trianon Garden (1759). In 1773 his nephew, Antoine-Laurent de Jussieu, having studied his uncle's grouping, communicated a paper to the Académie des Sciences on the Ranunculacæ, in which he showed the great truth of the relative value of characters, that they must be weighed, not counted. He extended his views to other Orders in the following year, and in 1789 published his "*Genera Plantarum secundum Ordines Naturales disposita*," which, according to Sir Joseph Hooker, "with slight modifications, has ever since retained its position as the basis of a complete scientific classification."

Robert Brown (born 1773, died 1858), "*facile princeps botanicorum*," as Humboldt termed him, was the first in this country to advocate the natural system. This he did in his "*Prodromus Floræ Novæ Hollandiæ*," published in 1810. In 1818 Augustin De Candolle commenced his "*magnum opus*," "*Prodromus Systematis Naturalis Vegetabilium*," which has been, with the assistance of many botanists, completed, in seventeen volumes, by his son Alphonse in 1873, and contains descriptions of every known species of Dicotyledon.

In 1821 was published the first British Flora on the new system, Samuel Gray's "*Natural Arrangement of British Plants*," and in 1829 Dr. Lindley produced his "*Synopsis of the British Flora*." In 1830 Sir William Jackson Hooker, who had continued the "*Flora Londinensis*" from 1821 to 1828, published the first edition of his "*British Flora*," and in 1843 Professor Babington issued the first edition of his "*Manual of British Botany*." Then commenced those great series of works which immortalise the names of Loudon and Hewett Watson. Loudon may be termed the Martyn of the period, and his works, especially the "*Encyclopedia of Plants*" (1855) are a wonderful summary marking the progress of half a century. Mr. Watson, in his

"Cybele Britannica" (1847-1859), not only did for British plants what Alphonse De Candolle has done for those of the world in his "*Géographie Botanique*" (1855), but anticipated many of the principles of that work. Leaving unmentioned much important matter in the pages of periodicals such as the "*Phytologist*," the "*Journal of Botany*," the "*Gardener's Chronicle*," and *SCIENCE-GOSSIP*, I will conclude this list of authorities with the name of a great work still in progress, the "*Genera Plantarum*" of Mr. Bentham and Sir Joseph Hooker.

There are, of course, many other important works published abroad, besides special papers, &c., of English authorship; I shall even refer to others in my research into the history of *Thalictrum*; but these are, I think, those most generally important in the history of British Botany.

G. S. BOULGER.

ON THE COLOURS OF ANIMALS, AND THE ARRANGEMENT OF PIGMENT IN LEPIDOPTERA.

By ALEXANDER M. MCALDOWIE, M.B., C.M.

ALTHOUGH limited to a few spots in man and a few of the higher vertebrata, and altogether absent in some of the lowest forms of animal life, pigment is of almost universal occurrence in the zoological kingdom. We gaze with wonder at the dazzling splendour of the tropical birds and butterflies which adorn our museums, and we admire even more the softer beauty of the fauna of more temperate regions, yet all this variety of tint is due to the deposition in various parts of the body of colouring matter, the nature and uses of which are as yet in many instances but imperfectly understood.

In some cases the use of pigment is to protect the deeper tissues from the bright glare of the sun by absorbing the rays of light. This is its function in the eye, where it prevents the rays from being reflected back on to the retina and interfering with vision. In most animals, however, pigment is present for the purpose of enabling them to conceal themselves from their enemies or their prey; the colour of the animal, as a rule, bearing more or less resemblance to that of the soil, herbage, or foliage in which it lives. This is very strikingly seen in the "leaf" insects, where the likeness is so close as to merit the appellation of "protective mimicry." It may also be observed in the eggs and young of birds which nidificate on the ground.

Some animals possess the power of changing their colour in a certain degree and assuming that of the surrounding medium. We have only to recall the story of the chameleon in illustration of this. It occurs in several reptiles, batrachians, and fishes.*

Many species of cuttle-fish can change their colours rapidly under irritation or excitement. In birds and mammalia, however, change of colour takes place much more slowly, and is produced by shedding the feathers or hair. This takes place at certain seasons; during the breeding season more especially, also in the winter. The former is seen in the ruff and many other birds, the latter in the ptarmigan, ermine, hare, and others. The minnow, stickle-back, and several other fishes exhibit bright iridescent tints during the spring time.

While noticing the uses of colouring matter in the

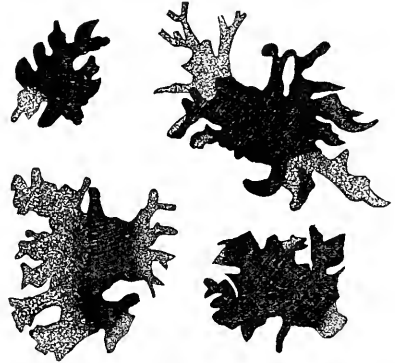


Fig. 33.—Pigment-cells from the Tadpole.

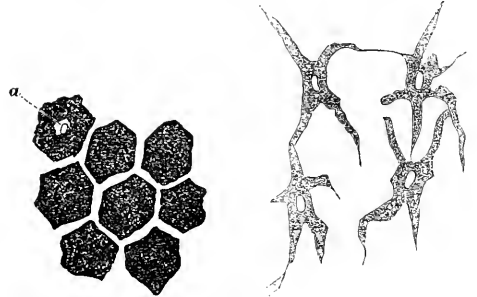


Fig. 34.—Pigment-cells still cohering, from the choroid; mag. 370 diameters (after Heule); a, nucleus.

Fig. 35.—Ramified pigment-cells, from the tissue of the choroid; mag. 350 diameter (after Kolliker).

animal kingdom, it is interesting to observe the difference between animals and plants in this respect. The colours of flowers are now understood to have reference only to the visits of insects.*

Pigment exists in the form of minute granules deposited in the connective tissue corpuscles or the epidermic or epithelial cells. The pigment-cells of connective tissue are usually of a stellate or ramified form (fig. 35), containing numerous processes. The nucleus of the cell remains colourless, and, as a rule, the ends of the processes contain no pigment. Brücke and Buchholz have observed movements in the stellate pigment-cells of batrachians and fishes. The

* See an interesting note on the Angler Fish in *SCIENCE-GOSSIP* for July.

* "Flowers," by Dr. Taylor, p. 14.

pigment granules were seen sometimes congregated in a spheroidal mass round the nucleus, at other times diffused in a radiating manner through the cell or into the processes. The movements were accompanied with shortening and elongation of the ramifications.

The changes of colour observed in the animals noticed previously are caused by alterations in the form of the pigment-cells, and are produced either spontaneously, or by variations in the intensity of light, or by other external stimuli. R. Wagner has observed extraordinary mobility in the pigment-cells of cuttle-fishes, which contain pigment granules of different colours and are termed "chromatophores." Von Wittich* has described the changes produced in the cells of *Hyla arborea* by electrical excitation, although Professor Rollett was unable to perceive any influence exerted on the pigment-cells of batrachians by the action of induction shocks of electricity.

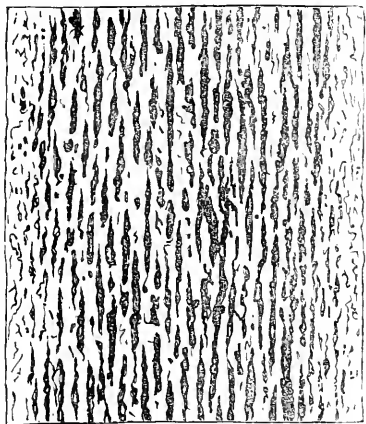


Fig. 36.—Cortical section of horsehair, showing the linear arrangement of pigment. $\frac{1}{4}$ -inch.

The pigment granules vary in colour and shape. Under the highest powers they exhibit no definite form, being often subcylindrical, or elongated with rounded extremities. Beale says: "They may be removed from the cell, and when they escape into the surrounding fluid they exhibit molecular movements."† In vertebrate animals the pigment is derived from the red blood corpuscles. These, as they grow old, part with their colouring matter to the serum. From thence it is taken up by the pigment-cells and condensed in their interior, where it undergoes several chemical changes and passes through several shades of colour. Kndfleisch states: "Should they (the pigment granules) be numerous enough to fill the protoplasm of a cell, the colourless nucleus is partly pushed aside, partly surrounded; the pigmented cell appearing to be perforated by a circular gap or hole. Flat cells (choroid coat of the eye), in which the nucleus is in contact with both surfaces at

once, retain their characteristic aspect (fig. 34). In spheroidal cells, however, the nucleus ultimately disappears, leaving a coloured corpuscle, in which only the external form of the cell can still be recognised."*

The source of the pigment in the invertebrata is not definitely known.

Pigment is also found in animals deposited in the hair, feathers, and other tegumentary appendages. In these situations it is not enclosed in cells. The pigment granules in the hair are located in the cortical



Fig. 37.—Portion of broken scale from *Argynnis Adippe*, $\frac{1}{4}$ inch.

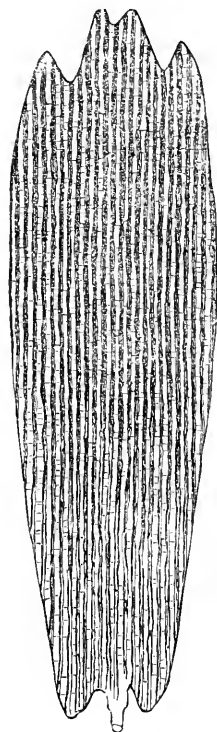


Fig. 38.—Black scale from *Urtica*, $\frac{1}{4}$ inch.

tissue, disposed in lines running parallel to the axis of the hair (fig. 36). They are exceedingly minute, estimated in the human hair at $\frac{1}{150000}$ inch in diameter. It is here that we must look for an analogy with that occurring in Lepidoptera. The scales of Lepidoptera are homologous to hair or feathers in their situation and appearance, and also analogous in their function. We find likewise a similarity between the arrangement of pigment in the scales and that in hair. The pigment is deposited between the fine membranous layers which compose the scales, and is arranged in parallel lines corresponding to the situation of the ribs or striæ. Under the microscope these appear as straight dark lines with irregular edges (fig. 37). As

* Müller's "Archiv," 1854, p. 41.

† "The Microscope in Medicine," p. 154.

* "Pathological Histology," vol. i. p. 62.

a rule the pigment is most thickly deposited in the upper third of the scale. It is sometimes altogether absent from the lower third. But it is occasionally pretty equally distributed over the whole scale, and down into the foot-stalk.

In a broken scale of the *Argynnis Adippe* the dark lines of pigment at the seat of the fracture appeared broken up into small irregular particles (fig. 37). These had no definite form, but were mostly angular in outline. It is not probable that these were the ultimate molecules of pigment.

In examining the scales from the wings of Lepidoptera which had been decolorised by chlorine, the lines appeared to be unchanged in their outline although they were not nearly so dark as before. To the naked eye the wings themselves had a translucent membranous appearance.

Many of the bright and lustrous tints seen in Lepidoptera are not due to pigment, but are produced by the surface and edges of the scales, which have the power of absorbing some of the prismatic colours and reflecting others.

MICROSCOPY.

A LIVE-BOX.—I send you a drawing of a live-box, which might be of interest to your readers. A, A are glass slips; B, B are brass bands; C, C are wedges;

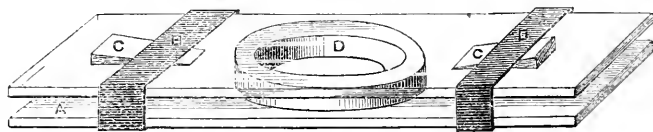


Fig. 39.—Improved live-box.

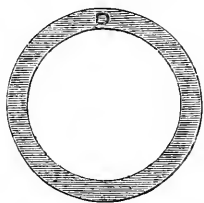


Fig. 40.—Thick india-rubber ring for live-box.

D is an india-rubber ring. The advantage gained by using this form of live-box is that it is thoroughly water-tight, and that it can be taken to pieces, cleaned, and put together in a very short space of time.—*Albert Smith.*

NEWCASTLE MICROSCOPICAL SOCIETY.—A general meeting of the North of England Microscopical Society was lately held. The following officers are appointed for the ensuing year:—President, Professor G. S. Brady, Mr. M. H. Robson, and a committee of ten. The inaugural meeting was held on Wednesday, January 8. This society has been formed to meet

a long existing want amongst microscopists, who will now have an opportunity of meeting at regular intervals with excellent accommodation, and under the direction of an organised society, which since the dissolution of the Newcastle-upon-Tyne Microscopical Society in 1864 they have not possessed.

THE PYGIDIUM OF INSECTS.—At a recent meeting of the Royal Microscopical Society, Mr. Henry Davis read a paper on this subject, in which he showed that the organ which went by this name had its representative in the Neuroptera, and other groups of insects, as well as in the flea, and the lacewing fly. He regarded the pygidium as a special organ of sensation for conveying to the insect an intimation of the presence of dangerous enemies.

ZOOLOGY.

BIRDS MIGRATING.—In compliance with your correspondent's wish, I write to tell you that I have noticed here (Oporto), during August, a migration similar to that mentioned in SCIENCE-GOSSIP of October 1. The night of August 26 was dark and hazy, the wind light and from the south or south-west. I heard more particularly from eight to nine o'clock P.M. fluty querulous notes from birds flying over my house from north to south, and not very swiftly. There appeared to be only one species, and the notes were in sets of four—tchoo-hoo-hoo-hoo. It was impossible to see the birds, although I tried repeatedly when some must have passed close over the house, which is on a hill to the north side of the mouth of the Douro, and about eight minutes' walk from the sea.

They seemed to pass in small flocks, keeping up a constant calling and answering. The notes were heard chiefly from eight to nine, but continued less frequently till late on in the night. I believe that hundreds, if not thousands, must have passed during that night. They had been heard some nights previously also. It would be interesting to learn the species to which these migrants belonged. That they were some species of large sandpiper I feel pretty certain, and I suspect they were red-shanks. Can any of your correspondents suggest how this could be ascertained with certainty? I noticed some days previously numbers of red-shanks, ringed dotterel, whimbrel, turnstones, and some smaller sandpipers on the banks of the Douro. Most of these were late arrivals from the north. Some possibly may have passed Maidstone! I suppose it would be difficult to devise some way of catching them while flying over at night? Could the phonograph be available for comparing the notes of birds? This is an interesting locality for observing the migration of

birds, such as the turtle dove, wood pigeon, hoopoe, flycatcher, pipits, skylark, starling, red-wing, lap-wing, golden plover, &c. We have arrivals of birds from the north to spend the winter here before all our summer visitants leave for the south.—*Wm. C. Tail, Foz do Douro, Oporto.*

HOUSE-FLIES AND THEIR PARASITES.—There can I think be little doubt that the parasite described by the Rev. W. Marsden Beeby was the young nymph of one of the Gamasinæ, which species or genus it would not be possible to say from the description, nor indeed are the genera and species of this family well settled. With regard to the question of whether the creatures are parasitic, or rather to what extent they are so, this is still a subject on which opinions differ; the older writers considered that many species were parasitic in all stages, but the researches of modern French acarologists make it probable that they are only parasitic in the larval stage, and in the active asexual stage which is called the nymph. M. Megnin, whose opinion deserves the highest possible consideration on such a subject, considers that the parasite is not in any way injurious to the fly, and only uses the fly, or other insect or creature, as a means of conveyance. I confess, however, that my own observations of the positions in which the nymphs of gamasids are found upon dipterous and hymenopterous insects would rather have led me to the conclusion that, at all events in some species, the gamasid seeks nourishment from the juices of the insect. The instruments resembling the large claws of a lobster would be the chelate mandibles of the Gamasus. These resemble the large claws (or chelæ) of the lobster and craw-fish, inasmuch as they are chelate, *i.e.* nipper-like, the fixed side of the nipper being formed by a toothed prolongation of the penultimate joint of the chelate limb or organ, and the movable side by the ultimate joint, which is drawn by powerful muscles against the prolongation of the penultimate. These mandibles, however, are not, like the lobster's claw, hard throughout their whole length; the two final joints only are hard, the posterior ones being elastic and extensible at will, so that the mandibles can be greatly protruded or wholly withdrawn within the body of the gamasid, nor can they probably be considered to be the true homologues of the lobster's claws, as these appear to be the appendages of the ninth cephalo-thoracic somite, and to constitute the anterior and prehensile pair of the ambulatory legs, whereas in the gamasid they are true mandibles. I confess that Mr. Beeby's description of the teeth made me somewhat hesitate as to whether the parasite was really a gamasid, as I am not aware of any mouth organs in Gamasinæ which can properly be called teeth. The mouth consists of the labium and maxillæ, which together form a suctorial sharp-pointed tube, of the mandibles above mentioned, a labium or lingua, and of a pair of maxillary palpi. At the base of

these, however, is an organ somewhat corresponding to the galea in Orthoptera, and this may possibly bear spines in some species. Finally, I may say that the acarid would not have remained long on the fly's foot; if left alone he would soon have mounted into some more convenient position on the body. If it were not for size, Mr. Beeby's description would answer equally well for a chelifer (say, such an one as Hermann's *C. parasita*, "*Mémoire aptérologique*," p. 117); indeed the pedipalpi of the chelifer are even more like lobsters' claws than the mandibles of the gamasid, but I presume that one of these well-known creatures would have been at once recognised. It is of course extremely easy to distinguish between the two, as the abdomen of the chelifer is segmented, while that of the gamasid is not.—*Albert D. Michael.*

"A RARE SPECIES OF HEMIPTERA."—Would it be possible to obtain from "John Davis" (the writer of the article headed "A Rare Species of Hemiptera," p. 9) an example of the creature which he describes? This I admit has fairly puzzled me. His calling it both a hemipterous insect and afterwards a "beetle" or a coleopterous insect is decidedly peculiar.—*C. O. Waterhouse.*

BIRDS AND FRUIT.—On December 23, whilst taking a country walk, I was surprised to see a hawthorn tree which grew up out of the hedge, laden with the following birds:—fieldfare, missel-thrush, song-thrush, blackbird, and green linnet. The bush had been evidently richly laden with scarlet haws, and the ground was covered with those which had been shaken off whilst the half-starving birds were feeding. I concealed myself and watched the birds I had disturbed return to their banquet. There could hardly have been less than a hundred individuals, and the voracity with which they devoured the tempting berries was both amusing and gratifying. The remarks of Dr. Taylor, in that chapter of his recently published "*Flowers; their Shapes, Perfumes, and Colours*," relating to "*Birds and Flowers*," that the red or other colours of fruits are for the sake of attracting birds, just as the colours of petals are to attract insects, came to my mind with great force. In this way one could see how useful both the colour and the succulent pericarp must be to seeds protected by "stone" and pericarps in distributing the seeds far and wide in the droppings of the birds. During my walk I afterwards saw the blackbirds and thrushes devouring the scarlet berries of the holly in a similar way.—*T. G. Hudson, Wolverhampton.*

THE WEATHER AND THE BIRDS.—The incoming of severe wintry weather at the beginning of December had been foreshadowed to the ornithologist by the large numbers of northern birds which visited our shores. Flocks of snow-buntings, as well as northern ducks (as the "long-tailed"), wax-wings, &c., visited the eastern coasts. The fieldfares have

been unusually numerous, and no doubt the influx of birds will help our native species to give a good account of the larvæ of insects. Wild duck, teal, widgeon, &c., were abundant in Norfolk and Suffolk, and were caught in immense numbers at the decoys. Scottish eagles found the Highlands too severe and drifted southerly to England, a golden eagle being shot at Fritton, near Lowestoft, where it and an unsung companion had been attracted by the hosts of wild fowl, &c. The poor paltry poppers at small birds from behind hedges have had capital "sport" this severe winter!

ERRATA.—In my note at page 14 of SCIENCE-GOSSIP for *Ziphius curvirostris* read *Ziphius cavirostris*, and for Professor Fowler read Professor Flower. —T. Southwell.

THE WATFORD NATURAL HISTORY SOCIETY.—Part II. of the second volume of the "Transactions" of this vigorous society is to hand, containing the Anniversary Address of the President (Dr. A. T. Brett), and papers on "British Butterflies" by the Rev. C. M. Perkins; "Observations on Injurious Insects," and "Economic Entomology," by Eleanor O. Ormerod.

THE MOA NOT YET EXTINCT (?)—A miner writes to a New Zealand paper to say that whilst he and his mate were prospecting for gold last autumn, between lake Rotorua and the Cannibal Gorges, in the province of Nelson, he saw what he believed to be the moa. His description is as follows:—"We heard a strange screeching noise in a gully about a hundred yards from where we were camped, and went to where the noise proceeded from, and to our surprise we saw two gigantic birds coming towards us. They did not show the least alarm at seeing us, but continued coming to where we were, so we took to our heels. We heard them two or three times that night again. Having no gun with us we thought it advisable to start the next morning, for fear they would tackle us. One of them was apparently about twelve feet high, and the other somewhat smaller, with feathers resembling the kiwi's."

BOTANY.

THE SEA LETTUCE (*Ulva latissima*).—At a recent meeting of the San Francisco Microscopical Society, a paper on the "Fruiting of Sea Lettuce," was read by C. L. Anderson, M.D., who said:—"A few days ago I collected a quantity of *Ulva latissima* for my marine aquarium. The fronds were well grown (October 26), of a beautiful deep green colour. The plant was put into the water at night. Next morning, quite early, the water had a turbid look, and I feared there was too much dead matter ever to become clear. But as the sun came to shine on the side of the aquarium, I noticed a band of green matter bordering

the side in the sunshine, and adhering, apparently, to the glass at the upper surface of the water, and the aquarium was clear. When the green band was touched there seemed to be a dispersion of the material, but readily coming together again. Like a cloud of very minute insects they were constantly changing the form of the mass, and, amœba-like, throwing out processes here and there, the greater part, however, clinging to the glass. Putting a small quantity under the microscope I found two kinds, or forms. One was quite round, and moved slowly, with an irregular rolling motion. I could not detect cilia, although the motion would indicate their presence. The other form was smaller, conical, and very active, moving so rapidly that at first I could not make out its form. A careful inspection revealed the fact that they were the zoospores of the ulva. The conical form had filaments at the apex. Carpenter says 'ciliated.' I would rather consider them as accessory to cilia, and intended as holdfasts that the plant may grow. Both Dr. Carpenter and Dr. Wythe present illustrations of these zoospores, showing their development from the frond cells of the ulva, and Carpenter remarks that 'they might easily be taken for true infusoria.' And so they might. On further examination I found some of these zoospores clinging to the broken walls of the cells, both forms, and exhibiting active exertions to be free. As to the generative process, of which Carpenter says, 'nothing whatever is known,' I am of the opinion that the filament spores are fertilised after their escape from the cell by the round spores, and that the latter, having performed their function, like the antherozoa, disappear, and the filament spores become fixed and grow by the multiplication of cells peculiar to other algæ. The next morning these zoospores had diffused themselves into the water, and the turbidity remains as it was the first morning before the 'swarming.' It is likely that nearly all these germs have perished in the water for want of a congenial place to become attached that they might grow."

"MONSTROSITIES" IN PLANTS.—In the middle of last summer I had many plants of Canterbury bells in my garden which had grown from seed that had been sown in 1876, only two plants of the lot having flowered in the year after they were sown, as biennials are supposed to do, and ripening their seeds before they died. The remainder became larger plants, and were all in the following summer now past covered with blossom. Some of the flowers were white, some blue. Among the plants with white flowers was nothing that I noticed as abnormal. Among those with blue flowers two plants presented variations worthy of notice. One of them was crowned with a terminal head of synanthic flowers, as nearly as can be like the figure of such a production in Dr. Masters's "Vegetable Teratology." The corollas of several flowers were fused into an oblong dish, to one end of

which adhered a somewhat similar formation proceeding from the fusion of two or more flowers, forming a cup or vase not quite so long or shallow. These two structures adhered to each other by the outer surfaces of their compound corollas, and seemed as if they were made up together of about five or seven flowers. This curious phenomenon proceeded apparently from fasciation: not from fusion of lateral flowers, for the fused flowers were all equally terminal. In the Canterbury bell, as in other species of *Campanula*, the sub-terminal flower does not expand till after those on the lower branches, and therefore is considerably later than the flower which terminates the stem. By keeping in view this rule, the synanthic termination of a fasciated stem may be easily distinguished from any possible fusion of lateral flowers. No other instance of synanthy was observed on the plant where this occurred, though it had a profusion of well-formed single flowers. Another plant which flowered at the same time bore flowers each of which had a double corolla. Nothing in the flower was misshapen. The inner corolla was bell-shaped like the outer, and its segments alternated with those of that within which it was. The stamens too alternated with the segments of the inner corolla, a fact which I noticed in several flowers and think of some importance, as it would place them in a different position with reference to the sepals than is the case with stamens of a flower whose corolla is single. All these plants have since died. When withered flowers were removed, or the plants were not exhausted by ripening seeds, other flower buds grew and were expanded, but no leaf bud was developed that might form the basis of a new growth. No foliar proliferation was to be found in any of the plants whose lives were strictly limited, so that it seems as if they cannot by any means become perennial.—*John Gibbs.*

TERATOLOGICAL NOTES.—I see in the September number of *SCIENCE-GOSSIP* a short account of the

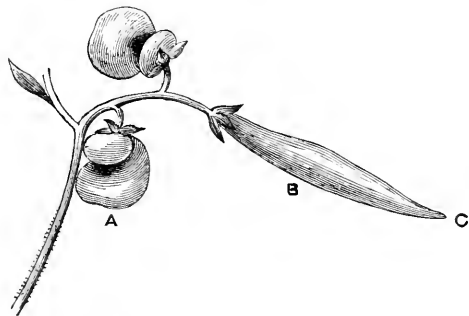


Fig. 41.—“Monstrous” *Calceolaria*: A, ordinary corolla; B, elongated hollow corolla, terminating in a small opening at c. Reduced $\frac{1}{2}$.

malformation of a common cabbage leaf. My slight experience of a similar phenomenon may be of interest. Some two or three years ago I came across a similar instance to that mentioned by your corre-

spondent. In my case several of these curious leaves were produced on the same plant within a short period of time, all more or less resembling one another. I have been informed by a friend that he has observed the same appearance in a geranium leaf. I have enclosed a rough sketch of curious form in the flower of a *calceolaria*. Two of these have been produced at about the same time on different plants in the same garden. I may mention the plant under consideration was not the common yellow variety, but a rich red-coloured species known to gardeners by the name “Prince of Orange.”—*A. H. Hinton.*

TERATOLOGY OF CLOVER.—I have found a head of Alsike clover, in which all the pistils are transformed into foliage leaves, similar, but on a smaller scale, to a single lobe of the regular leaves.—*B. K.*

EXCEPTIONAL FRUITFULNESS OF MOSSES THIS SEASON.—Is it the general experience of muscologists that the present season is an exceptional one with regard to the fruitfulness of mosses? In this district several kinds not generally in fruit are found with fruit, such as *Hypnum purum*, *squarrosun*, *tamariscinum*, *triquetrum*, *loreum*, &c. In an excursion of a few hours lately my brother and I found nearly sixty different species, more than one-half of which were in fruit.—*R. Wood, Rosley Vicarage, Carlisle.*

NEW SPECIES OF ISOETES.—Dr. Moore has recently given an account of a new species of *Isoetes* found in Upper Lake, Bray, county Wicklow, Ireland, which has been named *I. Moorei*. It strongly resembles *I. lacustris*.

WHITE VARIETIES.—I found two perfectly white plants of *Geranium pusillum* by a roadside in South Devon last autumn. In *SCIENCE-GOSSIP* for 1875, page 68, there is an account of a white variety of *G. molle*: as both nearly resemble each other, one of us may be mistaken. They are not mentioned in any botanical work I have seen.—*R. W. W.*

RANUNCULUS FICARIA.—Whilst taking a morning walk, at the beginning of last year, I was surprised to find what a difference occurred with regard to the number of petals in the lesser celandine (*Ranunculus Ficaria*). The smallest number I counted was six, and the largest on one flower was sixteen, just double the usual number. Probably in the latter case, some of the stamens had been converted into petals, but at that time I did not think of observing whether this was the case or not.—*J. A. Weldon, Northallerton.*

A NEW SPECIES OF BRITISH MOSS.—At a recent meeting of the Linnean Society Mr. E. Holmes showed examples of a species of Moss, *Aulacomnium turgidum*, new to our British cryptogamic flora. This acquisition had been obtained by Mr. West, a Bradford botanist, in Yorkshire. Mr. Holmes made some remarks, and comparisons between this species and *A. palustre*.

GEOLOGY.

BURROW, THE GEOLOGIST.—In your December number a slight reference is made to Mr. John Burrow, the "Settle Palæontologist"—where he is mentioned as "having spent his life in working out the palæontology of his district." Perhaps it may be worth noting that this was not strictly the case, and also that Mr. Burrow's work, in the fields of science, furnished us with a good instance of what may be done—as an interesting amusement—by our English youth. I first made the acquaintance of Mr. Burrow at Cambridge (where we kept in the same staircase), and afterwards had the privilege and pleasure of renewing our friendship in his own much loved Craven district. I frequently accompanied him to his pet productive spots about Settle, which he had explored for a considerable distance, and from which, by patient energy, he had made a rich ingathering of fossils—and all this (the point mainly to be noted) while he was as patiently working his way to the height of the sixth form in the neighbouring school at Giggleswick. At Cambridge he won triple honours—in mathematics, classics, and natural science—still keeping to geology as a recreation, and proceeding with the work of fossil-arrangement. Hence I venture to say that the great work which he did among the carboniferous rocks for palæontology, *was the work of a schoolboy*, and that, too, at a time when "natural science" was never mentioned in public school-life. Would that nowadays the interest of this kind of recreative health-giving science could compete in greater degree with the much-absorbing interests of athletics, cricket, and football, in our English schools.—*Matthew Wood, Evesham.*

THE ULTRA-GASEOUS STATE OF MATTER.—One of the most important discoveries in molecular physics is undoubtedly that just communicated to the Royal Society by Dr. Crookes, in a paper entitled "The Illumination of Lines of Molecular Pressure, and the Trajectory of Molecules." It has been so long taken for granted that there could be only three conditions in which matter existed—the solid, liquid, and gaseous—that it comes upon us with downright surprise to hear of a *fourth* condition—the ultra-gaseous. But there can be little doubt that Dr. Crooke's experiments have proved this. The paper is reported at some length in "Nature" for December 12, and we refer our readers to it for the details of the delicate experiments from which this important conclusion is arrived at. It would seem that the hypothetical "ether" of astronomers, which is supposed to fill space, is not so supposititious as some have argued.

MARINE FOSSILS IN GANNISTER BEDS.—Your correspondent, Jas. Nield, of Oldham, has, I am afraid, somewhat misapprehended the gist of my late discovery of the above in Northumberland. The

occurrence of marine forms in the lower coal-measures of England (not to be confounded with the often misnamed "lower coal-measures" of Scotland, which are the equivalent of our carboniferous limestone series) has long been well-known to geologists, and the neighbourhood of Oldham is the classical ground for such finds. Up to the beginning of the year just expired, however, the gannister series north of the Tees had been determined and mapped by means of stratigraphical evidence only, none but plant remains similar to those characterising the overlying beds (middle and upper coal-measures) having been recorded from these beds in the district. In February 1878, I hit upon the first batch of marine fossils in the south of Northumberland. Since then I have found more elsewhere in the county, and I am informed that others have in the meantime been detected in carrying out mining operations in South Durham. The entire interest of the find lies in the palæontological evidence of occasional marine conditions having persisted from upper carboniferous limestone or Yoredale beds into those of the coal-measures much further north than was believed by many (including myself) to be the case. Some important theoretical considerations with regard to the classification of the carboniferous rocks depend on such facts, and give them a greater interest than they might, at first sight, be supposed to possess. In the original notice of my find in "Nature" an unfortunate misprint occurred—*country* for *county*—whence, notwithstanding immediate correction, the present misapprehension may have arisen. Some account of the beds and their fossils will be found in my recently issued "Outlines of the Geology of Northumberland."—*G. H. Lebour.*

PLEISTOCENE DEPOSITS OF THE CORNISH COAST, NEAR PADSTOW.—This was the subject of a paper recently read before the Geological Society, by Mr. W. A. E. Ussher, F.G.S. The author described certain deposits seen in a small bay near St. Enodock's chapel, and known as Daymer Bay, and in section at Greenway cliffs. The former included a portion of raised beach, and a reef of consolidated old beach and a peaty deposit below high-water mark, the raised beach indicating a depression of from 5 to 10 feet and a subsequent elevation of more than that amount, during a pause in which the lower beach was formed. The further elevation of the coast was sufficient to favour the growth of forests furnishing the peaty bed, which a subsequent subsidence has brought down to its present level. Greenway cliffs consist of grey slates, resting against which, in two places, are old consolidated blown sands; about 5 feet above high-water mark is a raised beach, near which the face of the cliff consists of "head" capped by gravel. Mr. Ussher discussed the relative ages of these deposits, and inclined to regard the gravel as a fluvial deposit, and the stony loam or "head" as an ancient talus or flood-gravel, both deposited before the raised beach.

PECULIAR FOSSIL BRACHIOPOD.—Mr. John Young, F.G.S., has discovered a new species of Rhynchopora in the upper series of the carboniferous limestones, at Bovertrapping, near Dalry, Ayrshire. This genus was established by Professor M. King, of the Queen's College, Galway, for a species of Rhynchonella, whose shell showed a distinct perforated structure, which he had found in some places on the Continent in the Permian formation. Before the discovery of a perforated structure in this species it was included in the genus Rhynchonella, but is now named *Rhynchopora Ginitiziana*. Mr. Young finding the carboniferous specimen to be distinctly perforated sent it for determination to Mr. Thomas Davidson, F.G.S., Brighton, author of the Monograph of the "British fossil Brachiopoda," and he being satisfied of its punctate structure, forwarded it to Professor King, who writes that it is undoubtedly a new and second species of his genus Rhynchopora, and that he considers the carboniferous species an interesting discovery, confirming all he had already written as to the structure of the Permian shell. It is proposed by Mr. Davidson, who will figure and describe Mr. Young's specimen, to name the species *Rhynchopora Youngii* in honour of the discoverer.

SILURIAN FOSSILS IN THE GIRVAN DISTRICT.—This is the subject of a monography by Professor A. Nicholson and Robert Etheridge, jun., published by W. Blackwood & Sons. The monograph is a detailed descriptive catalogue of the fossils of the Silurian area of Girvan in Ayrshire, a district which has long presented peculiar geological difficulties. The authors have been assisted in their arduous work by a Government grant made through the Royal Society, and also by Mrs. Robert Gray, whose cabinet of Girvan fossils is especially rich, and has been of great use to the authors.

FOSSIL ENTOMOLOGY.—We specially direct the attention of our geological readers to the exhaustive and suggestive series of papers which are appearing in the "Entomologist's Monthly Magazine," on "Fossil Entomology," by Mr. Herbert Goss, F.L.S., F.G.S. The fourth paper appeared in the January number, on "The Insecta of the Carboniferous Period, and the Animals and Plants with which they were correlated."

NOTES AND QUERIES.

PIPING BULLFINCHES.—With reference to a query under head of "Piping Bullfinch" inserted in SCIENCE-GOSSIP for January, I would remark that Gilbert White no less than three times in his "Natural History of Selborne" alludes to the fact of the plumage of bullfinches becoming dark or black-coloured from the administration of hemp-seed. In the latest edition of White's "Selborne," by Thomas Bell, Esq., the author in a footnote states that the effect of a diet of hemp-seed in blacking the plumage of birds, and particularly the bullfinch, is now well known.—*John Colbrook.*

THE DOUBLEDAY COLLECTION.—Having lately gone through the above collection, it is satisfactory to say the collection is less deteriorated than appeared to be at first sight. There is not one type in the whole collection lost. Some erroneous statements have crept into several periodicals, stating that 238 species have been destroyed by mites. This I deny *in toto*. The collection is open for inspection, and all those interested are invited.—*James English.*

LEAFLESS TREES.—Although at the present wintry season of the year but few flowers either in the garden or the woods are left to gladden the sight, there is still to the observant eye a never failing charm in the leafless trees. When seen against a clear grey sky, each one has a form and beauty all its own—

"Alike yet various,
Here the grey smooth trunks of ash, or elm, or beech, distinctly shine
Within the twilight of their distant shades."

No tree in all the grove but has its charms, and each its hue peculiar at all seasons of the year; and we may, if we are observant, learn to distinguish the several kinds of trees as easily by their outlines in winter as by their leaves in summer. We have also been much interested in noticing the colour of the leafless trees surrounding our home when the sunshine has lighted them up; they then appear as if tinged with a deep red colour. We have much pondered over this appearance of the trees in the sunlight. We have since seen it noticed in a little book on "Field Flowers," by Shirley Hibberd. He remarks that, "if you had to paint a winter scene with sunshine, you would have to wash all the trees with a tone of red." What is the reason of this? We should be grateful if any of the readers of SCIENCE-GOSSIP would kindly explain the cause. Could it arise from the russet case, or envelope, in which the tender germ of the leaf is folded, uninjured, with inimitable art, till the bitter winds and cold frosts of winter have passed away? May be, Keble refers to this appearance of the trees in the wintry sunshine when he writes in one of his most beautiful hymns:

"Red o'er the forest peers the setting sun;
The line of yellow light dies fast away
That crowned the eastern cope; and chill and dun
Falls on the moor the brief November day."

E. Edwards.

PARASITES ON PIGEONS.—The best means for destroying the parasites on fantail and other pigeons, your correspondent "M. G." will find is to syringe well the house in which the pigeons live, themselves, and their nests with carbolic acid, diluted with water, at the same time using very freely Keating's Insect Powder. There is no danger of the parasites found upon pigeons, fowls, or other birds, forsaking them for man or womankind; they will not live upon the human body. The most sensible reason why pigeons' feathers should not be used for stuffing pillows, &c., appears to be, because they are too *stiff*, they would *mat* together, and so make but an uncomfortable rest for the head. For the same reason game and other small birds' feathers would not be desirable for stuffing pillows; the old superstition why they should not be thus used, we believe to be entirely without reason.—*E. Edwards.*

INTERESTING PLANTS IN THE ROYAL GARDENS, KEW.—On the west side of the palm-house is a most remarkable plant, which has given rise to a great deal of writing upon the disputed phenomenon of parthenogenesis, viz. *Calceogone ilicifolia*, a native of Australia, and included in the natural order Euphorbiaceæ. It is a small dioecious shrub with alternate spinose leaves closely resembling the common holly

(hence its specific name) ; the small greenish flowers are unisexual, the staminate flowers being borne on toothed bracts in axillary spikes, and the pistillate in a similar manner or in cymes. The first plants that arrived here were sent by Allan Cunningham, in 1829, and were all females. After a time some of these flowered, and, without the application of pollen, ripened seed which germinated and produced plants resembling the parent form. A communication of these facts to the Linnean Society by Mr. Smith ("Transactions of Society," vol. xviii.) drew considerable attention to the plant. Klotzsch examined the seed and stated that it contained a bud and not an embryo, but Braun, Radlkofer and others considered it as a true embryonic formation. Henslow states that it is possibly an analogous phenomenon to what takes place in some aphides, where one impregnation is sufficient for several generations. If that be the case, the definite settlement of any doubt resting upon the subject is merely a question of time, as it is almost impossible for true fertilisation to take place, there not being a single male plant in Europe. On the same side as the above we notice *Laportea stimulans*, an urticaceous plant with large crenulate ovate leaves, having numerous stinging hairs on both surfaces. This plant was found by Leschenault in Java, and he states that its sting produces inflammation and tetanic symptoms, similar to *Laportea crenulata*, but less severe. On the same authority we learn that the natives of Java rub buffaloes with the fresh leaves to excite them to fight with tigers. At the south end of the house is a magnificent specimen of *Grias cauliflora*, the anchovy pear of Jamaica, a native of the West Indies, included in the Order Myrtaceæ, tribe Barringtoniæ. Its generic name is derived from *grao*—to eat, alluding to the fruit; the specific name refers to the appearance of the flowers on the old wood. It is a slender, unbranched tree, having at the summit a crown of drooping lanceolate glossy green leaves, which are larger than those of any other dicotyledonous tree (3 feet long by $1\frac{1}{2}$ to 2 feet broad). The large white flowers spring in clusters from the stem, but they are rarely seen, and this plant has never flowered. The fruits are pickled and eaten like mangos, which they are said to resemble in flavour. We find on the shelf at the east side of the house a small plant of *Hura crepitans*, the sandbox-tree or Monkey's "Dinner Bell," considered as a native of tropical America, but now cultivated for shade through the tropics generally. It is a Euphorbiaceous tree of extremely quick growth; the wood is so soft that a clap of thunder or gust of wind will break the largest boughs. The fruit is a woody capsule of many cocci, which in drying burst open down the back into two valves, at the same time separating from the axis with the noise of a pistol shot. The juice of the tree contains an extremely poisonous principle. Boussingault relates that when he and M. Rivero analysed some of the milky juice, they were both attacked with erysipelas. It forms a large branching tree, 30 to 40 feet high, bearing unisexual, inconspicuous, reddish flowers. The female flowers have a very remarkable trumpet-shaped style, with a reflexed, many-toothed, terminal portion. The seeds are occasionally administered as a purgative to negroes, but are extremely dangerous, for two seeds have produced death.—*Lewis Castle, West Kensington Park.*

THE CULTIVATION OF MISTLETOE.—Seeing in the June number of SCIENCE-GOSSIP a botanical note by Mr. J. M. Higgins about growing mistletoe in Devonshire, where it is seldom seen, I thought it might interest some of your readers to hear about

attempts to grow it in Edinburgh, where it is never found in a state of nature. In the first week of February I planted about twenty seeds of mistletoe, in the same way as Mr. Higgins, on hawthorn, service, plane, poplar, pear and apple trees, and I may add that in no cases were they pecked at by birds. On April 24, when passing one of the apple-trees, I noticed that one of the seeds had begun to germinate, and on examining the others I found them beginning to smell and turn green; and by May 1, other seven seeds had burst and had protruded small green suckers, which have since taken hold on the bark. By the beginning of June the rest of the seeds, with a few exceptions, had sprouted, those on the apple and hawthorn trees being furthest on and healthiest looking. I have therefore great hopes of growing the parasite, and I may mention that several gentlemen in the neighbourhood have been very successful in its cultivation; one plant in particular which I have seen several times in a garden near is remarkably handsome and strong, being, I believe, about seven years old. There is one very good specimen of mistletoe in the Edinburgh Botanical Gardens, and I believe several smaller plants in Warriston Cemetery. Can any of your readers explain to me why four of my seeds have sent out two suckers apiece, while the rest of them have only sent out one each?—*Horace N. Bonar, Edinburgh.*

THE NIGHTINGALE IN YORKSHIRE.—Last May a man found a nest in a wood near Ripon. He thought it was a tree-pipit's nest, with curious coloured eggs in it. He took them to Mr. Pratt of Ripon, who told him they were nightingales' eggs and not tree-pipits. This is the first nest I have heard of being found in Yorkshire.—*James Ingleby.*

CUCKOO'S VISITS.—Mr. Bennett asks if the cuckoo revisits the same place yearly. I believe it does. A neighbour told me last May he heard a cuckoo with a very peculiar note for the last four years near his house; he was almost sure it was the same bird. In answer to the inquiry for a description of the cuckoo's eggs: They vary very much in colour, and very much resemble the birds' eggs of the nests they are placed in. Some are like meadow-pipits, others pied wagtails, some lighter in colour and others darker, and small for the size of the bird.—*James Ingleby.*

THE CUCKOO AND HER EGGS.—"The Universe," by F. A. Pouchet (Blackie & Son, 1877), speaking of the cuckoo laying her eggs in the nests of other birds, has the following, page 198:—"It is the nest of the golden crested, or common, wren that this bird selects for the accomplishment of its designs." Can any reader of SCIENCE-GOSSIP verify this statement from *personal observation*? Has any one ever seen a young cuckoo in a wren's nest? In matters of this nature statements not made from personal observation are of no value. After careful search and observation of many years, I have never myself found a cuckoo's egg or young except in the nest of a *ground-building bird*, never, indeed, except in the nest of the meadow-pipit and the grey wagtail. The writer also states that the cuckoo has "never more than two eggs." Has this been certainly ascertained, and how? Have any considerable number of birds been examined before the eggs come to maturity, to justify this statement?—*J. A. Kerr, Whiteabbey.*

MALFORMED EGG.—I have recently seen in this neighbourhood an egg from a Brahmapootra hen which contained within it another smaller egg. The inner egg was imbedded in the albumen of the outer one, and had pushed the yolk out of its normal

central position. Both eggs were covered by shell. Can any one explain the nature of this malformation?—*F. W. S., Todmorden.*

PRESERVING FOSSILS.—Having a number of mammalian remains from caves which seem liable to chip and decay after exposure to the air, I should be greatly obliged to any reader who would tell me the best treatment for their preservation. I have been advised to *paint* them over with hot solution of gelatine, but this does not appear to improve those specimens on which I have tried it. I should also be glad to learn the best plan of preserving fossils from the coal and chalk; some specimens from the lias are very liable to chip.—*W. G. Tuxford.*

PRONUNCIATION OF SCIENTIFIC NAMES.—The great difficulty is to find the place of the accent. There appears to be no certain rule for this; most frequently it is on the penultimate syllable, in other cases its place is determined by the etymology, and again in a few instances both systems find supporters, as in the case of *verónica* and *veronica*. Would it not be a good plan to mark the accented syllable in those generic and specific names occurring in at least the more popular of the manuals of the various branches of natural history? These accents need not appear on every repetition of the word, a good accented index would answer the purpose. The more fortunate of the dabblers in science, who live in large towns, and have the advantage of hearing lectures, and talking over their pet subjects with friends having a similar taste to their own, may not need this help, but it is different with those who live in out-of-the-way country places, and *read* but rarely *hear* anything about their favourite studies.—*W. G. Tuxford.*

BIRDS SINGING AT MIDNIGHT.—"X," expresses a wish to know whether it prevailed all over the country. I heard them singing on the nights of the 15th and 16th of February, 1878, and other nights as well.—*James Ingleby, Yorkshire.*

THE "FAGUS" OF CÆSAR.—Cæsar's words, "Materia cujusque generis, ut in Gallia, est, præter fagum atque abietem," have puzzled many, and Mr. Freeman has opened up a subject on which it may be hoped that other correspondents will give an opinion. Selby has touched on it in several places. It can scarcely be doubted that Cæsar must have seen the beech, which loves the chalk of Kent and Sussex, and is still the tree which characterises the hangers fringing the northern slope of the Sussex Downs, while as the sweet chestnut was (in all probability) introduced to Britain by the Romans, he appears to have noted its absence. Is it not then most likely that Cæsar's "Fagus" was the chestnut? Both trees grew in Italy in his days, as is apparent from Virgil. It may be observed that Linnaeus included the beech and the chestnut under the same generic name "Fagus." Has this led translators of Cæsar into an error? Old Gerarde's quaint comparison of the fruit of the two trees is worth quotation. Speaking of the beech, he says, "The fruit or mast is contained in a huske or cup that is prickly and rough bristled, yet not so much as that of the chestnut; which fruit being taken forth of the shells or urchin husks be covered with a soft and smooth skin, like in colour and smoothnesse to the chestnut." "The beech tree," he adds, "loveth a plaine and open country, and groweth very plentifully in many Forrests and desert places of Sussex, Kent, and sundry other counties."—*F. H. Arnold, L.L.B.*

COLOUR OF BIRDS' EGGS.—Can any of the readers of SCIENCE-GOSSIP inform me of any way to preserve the colour of birds' eggs from fading? I do not want

varnish; something that will not show, but keep the colour from growing dull?—*James Ingleby.*

BIRDS USING OTHERS' NESTS.—In connection with birds appropriating the nests of others to lay in, the following may be interesting:—Walking through a small copse in the early part of the summer I disturbed a blue-tit which flew from a large bush. It was soon joined by its mate, and by their rapid motions and uneasy cries I concluded that their nest was not far off. There was, however, no likely place for it to be built, and I thought there must be some other reason for the uneasiness of the birds. In the bush before me there was a blackbird's nest, which, judging from its very untidy appearance, I expected to find empty. I tried it however, and to my surprise found it contained seven blue-tit's eggs. The blackbird's nest had probably been robbed early in the spring, and the tits had lined it with some soft material, and there laid their eggs.—*T. L. S.*

FOSSIL FERNS.—I remember seeing in the British Museum some years ago a number of fossil ferns, the impressions beautifully coloured a bright emerald green, without destroying the sharpness. I should be glad to learn what colour is used for this purpose, and how applied.—*W. G. Tuxford.*

QUERY ABOUT THE DAISY.—Will any reader kindly inform me on what authority Chaucer, in "The Legend of Good Women," states the following:—

"The great goodness of the queen Alceste
That turned was into a daisy.
She that for her husband chose to die," &c.

* * * * *

"In remembrance of her, and in honour
Cybele made the daisy, and the flow'r
Ycrowned all with white, as men may see
And Mars gave her a crown'd red, pardie!
Instead of rubies set among the white."

C. F. W.

POISONOUS ACTION OF DULCAMARA.—With reference to your correspondent's query relative to the poisonous action of *Dulcamara* on man, I would beg to quote some interesting remarks from Professor Taylor's work on Poisons (3rd edition). That great toxicologist writes: "There are two species of nightshade (*Solanum*) *S. Dulcamara*, bitter-sweet or woody nightshade, which has a purple flower and bears red berries, and the *S. nigrum* or garden nightshade, with a white flower and black berries. Duval gave to dogs four ounces of the aqueous extract, and, in another experiment, 180 ripe berries of the *Dulcamara*, without any ill effects resulting. On the other hand, Floyer states that thirty of the berries killed a dog in three hours. The differences may perhaps be reconciled by supposing that the active principle, solania, on which the poisonous properties of both species depend, varies in proportion at different seasons of the year. In one instance a decoction of the plant is said to have produced in a man dimness of sight, giddiness, and trembling of the limbs. In September, 1853, the red berries of the woody nightshade are stated to have caused the death of a boy aged four. He had eaten some of the berries, and at first did not appear to suffer from them; but eleven hours afterwards he was attacked with vomiting, purging, and convulsions, which continued throughout the day, the child being insensible in the intervals. He died convulsed in about twenty-four hours. Other children had partaken of the berries at the same time, but one of them suffered only slightly."—*Lancet*, June 28, 1856, p. 715. All my own books on botany certainly point to the conclusion that *Dulcamara* berries are poisonous, although of much less virulence than those of belladonna; from which I suspect persons ignorant

of the nature of these two solanums have been led into some confusion. In the preparation of a conserve from the berries, probably the active principle solania was dispersed, if so, not only half a pound, but a much larger quantity of it could be taken with impunity; moreover, because the French chemist Duval gave both extract and berries to dogs without injury, does it follow that man should escape? I believe goats might eat any quantity without harm. I imagine no parent in his or her senses would permit a child to eat Dulcamara berries unless they wished to compass its death.—*John Colebrook.*

BOMBYCIDE (SATURNIA).—I have a fine specimen of *Hyalophora Cecropia* (6 inches across the wings), caught *alive* last July in a friend's garden at Clapham. Can any of your readers account for this? These moths surely never breed in England? Is it not likely to have escaped from some entomological cabinet?—*James Ives.*

TADPOLES.—On March 15, 1878, I collected some frog's spawn, placing it in a small jar in a warm corner of my room, and was surprised at seeing one four days later. The little tadpoles had escaped from their prisons. At that time each was attached to its parent egg, all traces of which further on had disappeared. I also noticed the ciliary movement mentioned by "R. B. C.," but once only, although I made continual observations as the animals became more developed.—*H. H., Aldeburgh, Suffolk.*

A SPECTRE OF THE MOUNTAIN.—During a tour of two months on the Continent, I chanced to witness the following beautiful phenomenon:—On Sunday afternoon, September 1, 1878, we ascended the Eggischorn, from the Hotel Jungfrau (which is 7000 feet above the sea). We reached the wooden cross on the summit (9640 feet) at 4.15. The day was dull, and the clouds were too thick to enable us to see clearly the glorious view of the Alps; the Aletsch Glacier and Mergelen See alone being plainly visible. Having stayed there about an hour, we were on the point of descending, when one of our party exclaimed, "Look, there is a rainbow!" and turning round I quickly added, "It is a spectre!" for gradually the phenomenon became visible, showing ourselves on the clouds facing us (in the east), surrounded by a double rainbow. To make sure that we were not imagining this beautiful vision, we waved our alpenstocks and hats, which were clearly discernible. Our height appeared somewhat elongated, so that the bar of the cross was lost in the rainbow. One apparent difference between this phenomenon and the so-called Spectre of the Brocken, was that we were not magnified, only lengthened, and that the bow was more arched than is usual. There were two guides and an Alpine traveller with us, none of whom had seen it before.—*H. J. Taylor.*

DOG AND KITTEN.—I have a high-bred pet blue terrier, who has hitherto appeared to live entirely for his master, and was at any rate a terror to cats, &c. In our house we have made several attempts to keep a cat, but our dog Charlie would not consent. About a week ago, a poor, weak, nearly starved to death kitten, about two months old, walked into the house, and was taken by our domestic quietly into the kitchen. Some food and milk was given to it, and pussy was placed snug in the corner of the fireplace, out of sight of the dog; but it was not many minutes before he discovered there was a cat in the house, and instantly went in the direction where she was lying, in a great state of excitement and ready for fight. The kitten was alarmed, and stood up. To

our surprise the dog, instead of attacking it, appeared to be instantly struck with its miserable appearance, and made no attempt to molest it. On the other hand, it showed evident signs of satisfaction, which soon convinced us that between the two there was a mutual understanding, for shortly after they were lying on the rug together. The same evening the usual saucer of milk was given to the dog, the cat followed the dog to the milk, and both lapped out of the saucer together. The cat-worrier and the kitten are now great friends. If this is not reason on the part of the dog, what is it? If it is at least sympathy, it is of a kind not often enough shown by those who claim the sole exclusive right to possess the higher quality.—*Alfred Tozer.*

BOUGAINVILLEA OR BUGAINVILLEA?—Having read in "Nature" of November 14 that the original use of catechisms was to give precision to oral religious instruction, I cannot think that there is any harm in an attempt to give precision to the teaching of science. Precision in the use of words is a quality not to be claimed by any writer who applies the term biennial to a cabbage. This is done in the first lesson in a little book on Elementary Botany by W. Bland, Master of the Endowed School, Duffield. It is nevertheless a very carefully written book, and that, nearly the only error which it contains, was probably the result of its author being misled by a similar statement in a Science primer by J. D. Hooker, C.B., P.R.S. The illustrious Director of the Royal Botanic Gardens, Kew, may be excused for not knowing that in my plebeian garden cabbages often live several years, and flower every season, which entitles them to be called perennial. Want of precision may be found sometimes in the orthography of generic names. One day last summer I saw and admired at a flower-show a plant labelled *Bougainvillea*. Wishing to know the Natural Order to which this plant belongs, I consulted the Index to Lindley's "Vegetable Kingdom," but found no such word. Having, however, by the kindness of a neighbouring gardener, gained possession of an inflorescence of the plant, I guessed from the examination of it that it might belong to the Order Nyctaginaceæ. Turning to Lindley's account of that Order, I found among its genera *Bugainvillea*. It would be nothing wonderful for a gardener's label to be inaccurate, but that on the plant in question could not be said to be so, as the name on it was identical with what is given in the "Official Guide to the Royal Botanic Gardens," by D. Oliver, F.R.S., F.L.S., Keeper of the Herbarium at the Royal Gardens, and Professor of Botany in University College, London. Of this authoritative Guide I happen to possess the twenty-sixth edition. I dare not presume to say it is inaccurate, but I should like to know whether the *Bougainvillea* mentioned in it be the same genus as in Lindley's "Vegetable Kingdom" is called *Bugainvillea*, and if so, whether in spelling the word I ought to follow Professor Lindley or Professor Oliver? So long as it remains uncertain, there can be no cause for apprehension that any catechism which may be written will give the precision of religious teaching to that of science.—*John Gibbs.*

THE HOUSE-FLY AND ITS PARASITE.—In the January number of SCIENCE-GOSSIP is an article on "The Development of the House-fly and its Parasite." Having given a good deal of attention to the house-fly, I am able to affirm that Mr. Robson has fallen into an error. The figure given is not *Musca domestica*. The antennæ are different, the eye is wrongly placed, the body is not the right shape, and the abdomen is

quite wrong. Moreover, the maggot figured is not the maggot of *Musca domestica*, neither is the chrysalis. Again, *Musca domestica* never lays its eggs on meat, nor will they, when hatched, feed on it, as far as I ever observed. The egg is much too large if only magnified 30 times, as the egg of *M. domestica* scarcely ever exceeds $\frac{1}{30}$ inch, which $\times 30$ would be only $1\frac{1}{2}$ inch, while the figure is $2\frac{1}{2}$ inches full. In fact, Mr. Robson has been examining one of the flesh-flies under an error. If confirmation of my correction be required, I refer to Samuelson and Hicks, or, in fact, any work on the subject.—*E. Holmes.*

DOUBLE ORANGE.—In opening an orange by "peeling" it, I have just come across what, to me, is a novelty amongst the many oranges in the dissection of which I have assisted, aided by my little household of seven or eight persons, but probably is well known amongst your botanical friends. However, as it may interest some of your readers, I send you a few remarks on it. On turning back a portion of the peel I found to my astonishment, instead of the usual orange pulp with its thin cuticle, the yellow peel of a miniature orange, of a conical form, having on one side a very distinct seam or opening reaching from the base to the apex of the cone. That the infant orange was easily separated from the giant that had buried it alive within its own body was shown by the nature of the union between the two, gaps occurring between the woolly substance of the larger orange, and the similar covering of the base of the cone. On carefully inserting a penknife between the two I found that the complete form of the embryo, if I am right in using that term, was that of two cones base to base; but whilst that end which I have described as lying just under the peel of its consumer was covered with a peel of the same nature and colour, but more delicate in texture and of a lighter hue, the end which joined the body of the orange was imbedded in the usual white woolly substance but of a finer grain, but no yellow peel, except that it had a decided yellow tinge at its apex. I have said that the embryo separated easily from its matrix. There was, however, on one side a small tough aggregation of fibres, forming a sort of hinge, after all the rest of the looser fibrous matter was separated. Perhaps some of your botanical friends will be good enough to tell me if they would consider this to be the undeveloped fruit stalk. By the help of a pocket glass on removing the embryo entire, I found that the under part, by which I mean the cone-like end which touched the body of the orange, was covered with the usual vein-like fibres, only, of course, very minute; and most interesting of all the folding in process of the fruit leaf's development was very clearly shown. Dissecting the embryo the centre was found to consist of a small sac containing a few cells of the same shape as the orange pip, but they were pulpy and yellow.—*M. A. S.*

INTELLIGENCE IN MAN AND ANIMALS.—The anecdotes of animals which have from time to time appeared in SCIENCE-GOSSIP and other publications, and a little personal observation and reflection, would, I should have thought, have suggested to your correspondent, Mr. H. D. Barclay, that what is called *instinct* in animals often passes under the name of *reason* in man, and that the difference which exists is chiefly one of development. Mr. Barclay says: "The great difficulty in the investigation of the minds of animals appears to be that man instinctively and unconsciously, unless checked by reflection, explains their actions, especially in extraordinary cases, by his own modes and laws of thought." Perhaps Mr.

Barclay will kindly inform us how else we are to explain their actions if we are not to use our "own modes and laws of thought." If an animal does precisely the same thing that a man would do under certain circumstances, are we not justified in concluding that animal and man are moved by the same power? Is not memory an act of reasoning? Is it simply instinct that induces a dog to starve itself to death on the grave of its master; or risk its life unbidden to save that of a helpless child? The wonderful feats that animals have been taught to perform, contrary to their natural habits, and the marvellous memory exhibited by many, are proofs, I think, that they are endowed with something more than mere instinct. The impression that the intelligence of animals differs from man's only in degree is founded on good evidence, and the difference between the intelligence of the beggar and the prince would in all probability be far greater than that between the beggar and his dog.—*A. C. Rogers, Red Lodge, Southampton.*

GLYCIPHAGUS PLUMIGER.—In the July number of SCIENCE-GOSSIP, Mr. A. D. Michael announced the capture of a single specimen of this acarus, and after remarking on one in the possession of Mr. George of Kirton Lindsay, says, "we may, I think, fairly claim this as a British species, although only a single individual has been detected in each instance." I have been fortunate in capturing a large number, male and female, of this interesting mite, and as in the former case, they were found among the fodder in a stable in this city. As there is a considerable quantity of foreign hay used in this place, it is quite probable it may have been introduced, but the fact of its being alive and active, in the middle of December, during a very severe frost, shows that it is hardy enough for our northern climate.—*J. Lambert, Edinburgh.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

JOHN LAMBERT (Edinburgh).—Many thanks for your excellently mounted slide of *Glyciphagus plumiger*.

T. R. JONES (Flint).—The fossils are:—1. *Producta Llangolliensis*, very abundant in the Carboniferous limestone rocks near Llangollen, North Wales; and 2. Fragment of fossil coral from same strata, called *Lonsdalea floriformis*.

H. L. SMITH.—You will find the best account of our British newts in Cooke's "British Reptiles," published by Hardwicke & Bogue, 192 Piccadilly, at 6s. It gives a full account of *Lissotriton punctatus*.

H. BANGHAM.—We cannot undertake to give the name of a moth from a magnified drawing of one of the antennæ, although the structure much resembles that of the antennæ of the fox-moth.

W. BENNETT (Hereford).—Your bat cannot be without ears. Perhaps they are very small, and, if so, it may be the whiskered bat or the barbastelle. You should show the specimen to some competent naturalist, as it is desirable to know more about our British bats than we do.

TRACY APFLETON.—A good and cheap popular work on ornithology is that on "Birds" by Adam White, published by Routledge, at 7s. 6d. The same firm have also issued the "British Ornithology," by P. H. Gosse, at the same price.

J. N. D. (Tuxford).—We quite agree with you in your remarks as to Wood's work. The best book we know as a calendar is the Rev. Leonard Jenyns's "Observations in Natural History, with an Introduction on the Habit of Observing as connected with the Study of that Science, also a Calendar of Periodic Phenomena in Natural History." It is published by Van Voorst, at 10s. 6d.

NEW CROSS MICROSCOPICAL SOCIETY.—C. W. L. enquires for the place of meeting and name of the secretary of the above society. Perhaps some of our readers will answer him.

J. R. N.—Your little fish is the black goby (*Cobius niger*).
J. A. WHELDON.—Stark's "History of British Mosses," price 7s. 6d., published by Routledge; and Cooke's "British Fungi," price 6s., published by Hardwicke & Bogue, 192 Piccadilly.

Any Cheltenham coleopterist who would be willing to assist a beginner in naming some specimens is requested to forward his name and address to the Editor.

PERCA.—Mr. Frank Buckland's "British Fishes," published by the Society for the Diffusion of Christian Knowledge, is a good introduction to the fishes of the British Islands. The volume on Fishes, published in Jardine's "Naturalists' Library" (Hardwicke & Bogue), is another good volume.

S. B. A.—Both jellyfish and sea-anemones may be preserved in a solution of picric acid.

W. G. PEARCE.—There is a microscopical society at Bath, and if there is not already a natural history society there, it is not for lack of workers and others interested in the study. We should think it would require little effort to found a society there.

R. H. W.—You will find full instructions for making artificial sea-water, &c. in Taylor's "Aquarium: its History, Structure, and Management," published at 6s. by Hardwicke & Bogue.

T. S. P.—The fossils are:—1. Head of Phacops, a Silurian trilobite; 2. Portion of a cystidæ, a peculiar form of sea-lily or encrinite; 3. *Atrypa reticularis*.

J. A. KAY.—In the answer to your question last month the words, "having the outline of your sketch," should have followed after the words, "more than fifty species of Navicula." There are more than one thousand species of Navicula known altogether.

J. FINNEMORE.—Mr. G. M. Gowan, of 20 Beauchamp Square, Leamington, writes as follows:—"I see by SCIENCE-GOSSIP for January that Mr. Finnemore (of Truro) wishes for Smith's "Synopsis of the British Diatomaceæ." I have a copy of it, two volumes, in boards, one or two plates, loose, but quite complete. I am willing to part with it, should it be worth Mr. F.'s while to offer a fair price for so rare a work."

EXCHANGES.

FIRST CLASS human physiological and pathological microscopic slides, mounted by Hunter, in exchange for good British lepidoptera.—E. H. Jones, Rosslyn House, The Park, Ealing.

ACME LINEATA, *Vertigo substriata*, *Helix lamellata*, *H. aculeata*, *H. pygmaea*, *H. fusca*, for any *Vertigo Moulinsiana*, *Testacella haliotidea*, or *Geomalacus maculosus*, or any other good shells.—J. Whitwham, Cross Lane Marsh, Huddersfield.

ANATOMICAL sections wanted for well-mounted slides.—F. W. Edwards, 32 Hunslet Lane, Leeds.

FORAMINIFEROUS sand from Barmouth, containing many rare forms, in exchange for slides, material, or minerals.—J. W. Cotton, F.G.S., Barmouth.

Will forward to anyone interested a copy of my new private exchange list for skins and eggs, compiled to facilitate exchanges and other useful purposes.—"Author," 11 Priory Road, Sheffield.

Will give a collection of shells for any volume of SCIENCE-GOSSIP; want all years since commencement. Also want Turton's "Land and Fresh-water Shells."—Mussion, 68 Goldsmith Street, Nottingham.

In duplicate about 100 different species of the British land and fresh-water shells, including well-authenticated examples of *Vertigo minutissima*, *V. alpestris*, *V. pusilla*, *V. substriata*, *V. angustior*, *L. involuta*, *L. Burnetti*, *Succinea oblonga*. Desiderata: good (named) foreign land shells, or numerous species of British birds' eggs, many by no means rare.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

CRYSTALS of salicine or potassic chlorate, in exchange for other well-mounted slides.—Thomas Shipton, The Terrace, Chesterfield.

WANTED, a good 1-inch object-glass. Offered geological, physiological, and other slides, many suitable for polariscope.—M. Fowler, Burn Row, Slanmannon, N.B.

OFFERED, Nos. 3, 38, 116, 173, 192, 206, 217, 355, 358, 384, 515, 543, 557, 667, 709, 1109, 1607, 1614, 1626, for other species.—D. J. Powrie, 3 Greenbank Street, Galashiels, N.B.

H. PYGMAEA, *C. minimum*, *A. tridens*, and many other species from North Wales, offered for good specimens of *Zonites cellarius*, *nitidulus*, *nitidus*, *glaber*, *alliaris*, or *excavatus*.—George Taylor, Mold, North Wales.

SCIENCE-GOSSIP, 1874, 1875, bound; having duplicates of these, will exchange for other books, pocket microscope, or natural history objects.—3 Belmont Villas, New Brompton, Kent.

BRITISH coleoptera, complete collection, male and female specimens of nearly every British species; 8000 specimens, mounted on cardboard, without pins (new style); correctly named. Particulars sent. Also collection of British birds' eggs, side-blown, labelled; well-marked specimens, 100 varieties. Also South African and American collections. Wanted, any foreign eggs. Send list.—Henry Sissons, Westbourne Road, Sheffield.

RARE European, British, and African eggs and skins. Full lists upon application. Wanted eggs and skins in exchange.—Sissons, Sharrow, Sheffield.

WANTED, specimens of *Ophiocoma* and *Coryne pusilla*; exchange.—3 Belmont Villas, New Brompton, Kent.

FORAMINIFERA from several localities, also zoophytes and mosses named and localised, well-mounted in balsam or damar; plant hairs, &c., for other slides or unmounted sections, &c., or offers in shells, &c.—Mrs. Skilton, London Road, Brentford.

WANTED, unmounted animal parasites, fleas, and ixodes, those from exotic animals preferred.—W. A. Hyslop, 22 Palmerston Place, Edinburgh.

In exchange for good fronds of *Fenestella* from Silurian, Devonian, or Permian; offer carboniferous or Bala fossils.—G. W. Shrubsole, Chester.

OFFERED, American lepidoptera. Wanted, pupas of silk-worm, death's-head, swallow-tail, emperor; eggs of *Bombyx Zamanit* and *Chimpha*.—T. Stock, 16 Colville Place, Edinburgh.

WELL-MOUNTED slides in exchange for good diatoms, mounted or unmounted.—Jas. Black-haw, 78 Loxells Road, Birmingham.

WANTED, a good second-hand copy of Gosse's "Marine Zoology of the British Isles," in exchange for other works on natural history, or for cash.—G. N. W., 10 Edinburgh Place, Weston-super-Mare.

UNIO TUMIDUS, *U. pictorum*, *Anodonta cygnea*, *A. anatina*, *Valvata cristata*, *L. peregra*, var. *maritima*, *L. auricularia*, var. *acuta*, *L. glutinosa*, *A. Grayana*, *L. agrestis*, *L. marginatus*, *H. pomatia*, *H. hispida*, var. *alba*, *H. hispida*, var. *subviridis*, *A. aculeata*, *C. myosotis*, and many other British species, for a copy of Rye's "British Beetles," or foreign shells.—Address E. K. F., 82 Abbey Street, Faversham, Kent.

A FINE series of trilobites (including the new Silurian forms, in exchange for microscopic rock sections.—Dr. Callaway, Wellington, Salop.

I HAVE several slides of interest to exchange for well-mounted objects. Lists if required.—T. Conlidge, 5 Norfolk Street, Brighton.

UNMOUNTED micro material in great variety, including highly interesting and beautiful marine objects, such as Foraminifera, zoophytes, sertularians, Echinidæ, Crustacea, Holothuria plates, diatoms, and *in situ* on Algae in splendid condition; fruited Algae, named, some prepared for balsam; marine Entomostracæ and larva, &c.; and some very good slides of same. Wanted, first class micro and lantern slides. Particulars on receipt of stamped address.—T. McGann, Burren, Ireland.

A GOOD 24-inch four-draw telescope in exchange. Wanted, good slides, Slack's "Marvels of Pond Life," or other books on microscopic subjects.—S. C. Hincks, Runfold, Farnham, Surrey.

WANTED, transparent unmounted material in exchange for others, or Chinese natural curiosities, including insect architecture.—Tylar, 165 Well Street, Birmingham.

COLEOPTERA.—*Necrobis ruficollis*, *Timarcha coriaria*, *Agelastica hyalinata*, *Donacia sericea*, *Coccinella 22-punctata*, &c. for other species. Desiderata numerous.—Address, J. Wilcock, 85 Northgate, Wakefield.

L. C. 7th ed. Nos. 291, 334, 353, 556, 710, 841b, 911, 858, 958, 1059, 1270, 1323, 1430, 1441, 1446, 1447, 1471, 1516, 1537, 1614, 1619, and others, for 5, 10, 44, 135, 174, 194, 215, 228, 235, 348, 351, 360, and others.—T. Rogers, 27 Oldham Road, Manchester.

BOOKS, ETC. RECEIVED.

"Geological Stories." Fourth edition. By J. E. Taylor, F.G.S., &c. London: Hardwicke & Bogue.

"A Monograph of the Silurian Fossils of the Girvan District in Ayrshire." By Professor H. A. Nicholson and R. Etheridge, jun., F.G.S. London: W. Blackwood & Sons.]

"Popular Science Review," January.

"Midland Naturalist," January.

"Land and Water," January.

"American Naturalist," December.

"Canadian Entomologist," December.

"Botanische Zeitung," December.

"Science pour Tous."

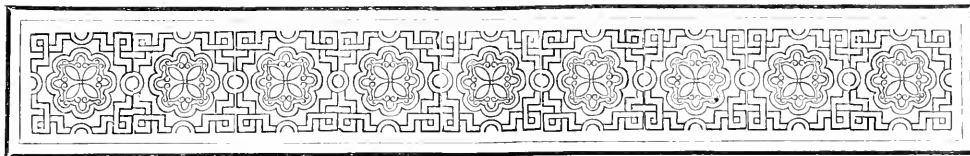
"Science News," (Salem, Mass.)

"Scottish Naturalist," January.

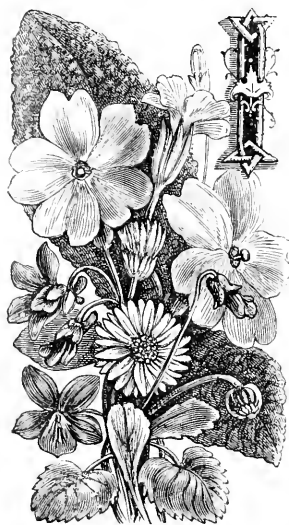
"Journal of Applied Science," January.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—
W. B. H.—A. S.—C. R.—J. P. T.—Colonel B.—J. D.—G. C.—
E. H. J.—J. S.—J. F. R.—M. W.—H. B.—H. N. B.—
J. M. T.—R. W.—J. A. W.—F. H. A.—W. C. T.—F. W. S.—
A. T.—C. F. W.—H. J. T.—H. B.—H. K.—J. I.—J. C.—
G. O. P. C.—J. W.—M. A. S.—T. B. W.—E. W. M.—W. H. S.—
A. J. J. B.—W. N. C.—K. D.—F. A. L.—D. J. P.—J. W. H.—
S. B. A.—C. A. G.—H. U.—J. J. W.—C. F. L.—W. W.—
W. G. W.—R. M. M.—G. H. L.—C. O. W.—M. F.—T. S.—
E. B. F.—E. D.—J. H. G.—E. H.—W. B.—J. P.—W. S.—
H. P. M.—J. B.—D. H. P.—F. L. St. A.—J. A. W.—T. S.—
H. P. S.—G. W. S.—H. C. W.—H. M. P.—W. A. H.—M. S.—
J. H. S.—A. G. R.—G. T. M.—H. S.—Dr. M. A. M. B.—
J. A.—F. W. E.—G. D. S.—M. D.—J. W. D. K.—E. L. F.—
G. T.—G. E. M.—J. W. C.—G. R.—T. L.—T. C.—W. G. P.—
Dr. C. C. S.—C. H.—G. P.—D. D.—B. S. D.—E. D. M.—
T. Mc G.—J. W.—T. J.—W. S.—G. M. G.—R. H. W.—
T. R.—W. W.—&c.



NOTE ON PREPARING AND PRESERVING DELICATE ORGANISMS.*



It will not do to rely on the chemists and druggists of the south of France or the Italian coast for the chemicals requisite for researches in the natural history of those parts. If you go to these worthy folk and ask for what you want, they will stare at you and ask if you are a doctor, or what you intend to do. If you explain, they will gaze at you in astonishment, and

perhaps ask to see your papers, and you will be lucky if they do not denounce you to the police! It is therefore necessary to carry all requisites with one. But liquid chemicals are bulky, and leaky bottles may stain the contents of the portmanteau; besides which the stock is soon exhausted. Crystalline substances, on the other hand, are easily conveyed, and contain in small bulk enough material to prepare and preserve a large number of objects.

The beautiful orange crystals of bichromate of potash form a very suitable solution for histological researches and for the preservation of delicate organisms. A few grammes of this salt, portable in any box, will meet all requirements. It dissolves in fresh or salt water, a few crystals saturating a large bulk. In this solution all the lower gelatinous animals, such as polypes, Hydromedusæ, Medusæ, Salpæ, ctenophora, &c., can be perfectly preserved. The shell-less mollusca and annelids, and all worms with tough skin can be kept in it. Small crustacea and bryozoa give also excellent results. We have kept a splendid *Adusa aurita* in this way for a whole year, and its

beauty and transparency leave nothing to be desired. But this solution has one inconvenience, it permits the development of mould; but this can be prevented by the addition of a few drops of phenic acid or phenic alcohol.

For histological purposes it is as good as, but acts more delicately than chromic acid. It hardens the tissues, brings out the outlines of the cellules, shows their nuclei, and coagulates the sarcode. It is also a valuable agent in maceration, dissolving in most cases the intercellular cement and separating the parts. On this account only tough-skinned organisms can be preserved in it, lest the tissues fall to pieces. Still the most delicate parts of the vibratile cilia and infusoria are well preserved.

Another convenient and portable salt is permanganate of potash, a little of which goes a long way. It is especially good in histological researches, as it acts like osmic acid, burning up the protoplasm, bringing out the minutæ, and showing the nuclei outlines of cells, &c. It is used as a saturated solution in distilled or very pure spring water. Sea-water also dissolves it. The concentrated solution, of a lovely violet colour, kills small organisms at once, and then burns them. They are left in it from thirty minutes to an hour, then withdrawn and placed in alcohol, after which they can be made transparent with essence of terebinth and mounted in Canada balsam. Beautiful results are thus obtained with echinoderms, zoophytes, worms, and marine arthropoda. For delicate researches, especially in the ciliated infusoria, it is better than osmic acid without its great cost, and is everywhere easily obtained. G. DU P.

NOTE BY TRANSLATOR.—Permanganate being deliquescent, and both salts highly coloured, wide-mouthed bottles will be found the best mode of conveyance; the corks being coated inside with beeswax or other protecting substance. The prices of the salts are, bichromate, 1s. 4d. per lb., and permanganate, 8d. per oz. W. H. D.

* By G. du Flessis, in "Bulletin de la Société Vaudoise des Sciences Naturelles," sér. 2, vol. xv. pp. 278-280, April 1878. Translated by W. H. Dalton.

NOTES OF AN AMATEUR ON SOME CANADIAN PLANTS.

THE pitcher-plant, *Sarracenia purpurea*, which grows in great abundance in our swamps and marshes, is said to be possessed of very valuable medicinal properties, as a mitigator of the severer symptoms of smallpox. I am not prepared to hazard an opinion respecting the properties thus claimed for it, but I think it probable that there are many plants, wild plants especially, whose virtues are still undeveloped; nor is it unlikely that it may have pleased the God of Nature to provide that our discovery of those virtues should be gradual and progressive, for the purpose of inciting us to persevere in our endeavours to increase our stores of knowledge, and thus to be constantly adding to the fresh disclosures ever coming to light of His wisdom and His goodness.

The pitcher-plant, belonging to the Order Sarraceniacæ, is a semi-aquatic plant, belonging to the water-pitcher family, and luxuriates in moist situations; but I have grown it, although without signal success, in my garden, and, with better effect, in large pots or boxes filled partly with rough peat-soil and partly with sphagnum moss. I never found the leaves of the plant without cold water in them, even in the hottest weather, floating on which are invariably discovered a number of minute drowned or drowning insects.

There is a swamp, in the neighbourhood of this town, in which, in addition to pitcher-plants, are found many other interesting specimens of our flora, e.g. *Ledum palustre*, *Ledum latifolium*, *Kalmia angustifolia*, &c., plants known in England by the conventional term, "American Plants," and cultivated "at home" with great care and at considerable cost.

The milkweed, *Asclepias*.—This family is variously divided, by different botanists, into, 51, 36, and 22 species. The last is the American limit.

The spring-shoots of one of these plants, *A. Syriaca*, are used by the habitants of the Province of Quebec as an esculent; and the cotton, soft as down, concealed within its pods, forms, in some cases, the stuffing of their beds. This cotton is of peculiarly soft texture, and has, in consequence, been called "Virginian silk."

Another of the milkweeds, *A. tuberosa*, is a common plant in the county of Peterborough. It is a very showy plant, with bright orange umbellate blossoms. The English name of this species is the pleurisy-root. The family, as we are informed by Gray, derives its name from Æsculapius.

I do not think there would be much difficulty in cultivating the milkweeds with beneficial commercial results. The requisites would be a very light soil and abundant space.

New Jersey Tea, *Ceanothus Americanus*.—This is an ornamental shrub, growing to the height of from

three to four feet, and embellished, in summer, with clusters of elegant white flowers possessing a faintly sweet perfume. The shrub dies down to the roots every winter. It has, not unfrequently, been used as a substitute for the Chinese leaves; but although by no means unpalatable, we Canadians cannot flatter ourselves that it will ever prove a formidable rival to either Hyson or Bohea.

It is, however, satisfactory to know that in the event of our supply from the Celestial Empire being at any time cut off, we may still indulge,—furnished by our own soil, for I have tasted the infusion,—in the "cups that cheer but not inebriate."

VINCENT CLEMENTI, B.A.

Peterborough, Canada.

PHYSIOLOGICAL CHARACTER OF FENESTELLA.

By G. R. VINE.

(Continued from page 276, vol. 1878.)

IN the study of the polyzoa—whether recent or fossil—two distinct characters are presented to our view: A true morphological, and a true physiological character. The morphology of the fossil polyzoa seems to come more fully within the descriptive range of the palæontologist than the other; but if the biologist is allowed to speculate when dealing with living forms, surely when dealing with the more ancient forms, sound physiological knowledge will be an advantage rather than a disparagement. Hence, in applying the results of modern investigation into the biology of the polyzoa, I have been guided in my selection more by the necessity on the part of the reader of the accurate appreciation of these results, than by the many and varied character of the investigations; some of which are too elaborate for general appreciation.

It seems to me then to be an axiom by no means inappreciable that the life history of the palæozoic polyzoa can form no exception to the life history of polyzoa generally. The definite forms of the one are as truly characteristic as the definite forms of the other. Among recent polyzoa no type exists bearing the close affinities with the palæozoic types, the nearest approach to the Fenestella being the Retiheronera of Kirchenpaur. These, however, differ in many particulars—especially so in the mode of development of the cells along the sides of the fenestrules, and of the non-existence of a central keel. But the vital actions of the individual animals of the Retiheronera were essentially of the same character as the vital actions of the animals of Fenestella. It will be well, therefore, to devote a few paragraphs to the record of the ordinary modes of propagation noticeable among the polyzoa, so that we may be able to appreciate more fully the value and the bearing of the facts which will follow.

According to Dr. Allman, the polyzoa have three distinct modes of reproduction. By buds or gemmæ, by true ova, and by free locomotive embryos.

The gemmæ or buds are developed on the body of the polypides: this always happens whenever the cells are in mutual apposition. If the cells are distinct they are developed from the connecting stem or stolon, as in the recent *Laguncula reptans*.

"The best examples" of the former mode "are furnished by the Flustra and their allies. From a single cell of the Flustra five such buds may be sent off, which develop themselves into new polypides around it; and these in their turn produce buds from their unattached margins, so as rapidly to augment the number of cells to a very large amount. To this extension there seems no definite limit, and it often happens that the cells in the central portion of the leaf-like expansion of a Flustra are devoid of contents and have lost their vitality whilst their edges are in a state of active growth."*

Since this was written the "dead cells" have formed the subject of many an excellent paper by Claparède, Smitt, Nitsche, and Hincks. The cells are not dead in a true and literal sense, for they often contain black or brown spots, supposed by Ellis (1755) "to be the remains of the animals once inhabiting these cells." These dark bodies are supposed—and their history has been accurately traced by Hincks—to be "germ capsules," and these may be characterised, if not as a fourth, at least as a very peculiar method of reproduction. This view, however, is opposed to that of Claparède who considered the "dark bodies to be the result of retrogressive metamorphosis of the original polypides which, under certain circumstances shrink back into this rudimentary condition, passing through the same stages in their decline as in their progress towards maturity, but in an inverse order."†

Reproduction by ova is the result of impregnation of the ova with the spermatozoa. Both the male and the female particles are developed within the same polypides, only situated in different parts of the body.‡ The embryo is first a hollow sphere, a layer is then thrown off from the surface at the same time that an opening is made in the wall of the sphere; a second sort of little sphere is thus formed within the first, and here little polypides are gradually developed.§ This development often takes place within the body of the parent, and their final discharge is by an opening situated beneath the tentacular circle.

I do not take into this account all the facts that have been promulgated respecting the reproduction of polyzoa by buds and by fertilised ova. A good paper by Nitsche, on the mode of reproduction of *Flustra membranacea*, is to be found in the "Quarterly Journal

of the Microscopical Society," vol. ii. It is true, however, that not all the polypes are equally reproductive. In recent polyzoa, and in all probability in the fossil also, there were distinct centres of reproductive energy. These are the oöcæia or the ovicells of Busk and others. In some of the polyzoa the ovicells are separated from the ordinary cell structure and are developed in the axils of the zooecia, or else by an inflation of the ordinary cell. Among the cyclostomatous polyzoa, the ovicells of Crisia and Crisia are thus formed in the axils. The observations made on the ovicells of Idmonæidæ are scanty—but in the species called *Idmonæa gracillima*, brought to light during the Porcupine soundings from a depth in the Atlantic at from 286 to 322 fathoms, the ovicells are pyriform like Crisia.

In *Hornera frondiculata* the ovicells are oblong and keeled—and in this and in several other species they are dorsal: while in *H. violacea* the ovicells are anterior either wholly or in part. They are unknown in Retihera, but in Pustulopora they are tumid. In the Tubuliporida (Alecto and Tubulipora) the ovicells are represented by an uniform inflation of a part of the zoarium.

The ovarian cells of many of the Cheilostomata are cells situated among the ordinary cells of the polyzoary. They are known by certain characters and are easily distinguished by those who are in any way acquainted with the polyzoa. In the Salicornaria either a conical tooth or an elongated slit marks the ovarian cell. In the Membranipora, they are either triangularly marked, deeply immersed, or large and conspicuous. In Lepralia some are peculiarly punctured, or else globose. In Cellepora and Eschara they are either globose or else subglobose—except in *E. monilifera*, here there are no ovicells but what answers the same purpose—fertile cells, large, depressed, and irregularly placed. In Melicerita the ovicells are immersed, opening with a crescentic within the summit of the cell; while in Retepora there is either a vertical slit, or a large opening in front.

To the living polyzoa two very remarkable, but minute appendages are attached. One is the avicularia, or bird's head process; the other is the vibracula or whip-like spines. Much doubt exists as to the real function of either of the appendages. They are present in nearly all the Cheilostomatous polyzoa. In the Cyclostomata these appendages are rare—probably the vibracula are only found among the Crisia and the Crisida—and as the carboniferous polyzoa are generally placed among the Cyclostomata it would be useless therefore to seek for these appendages. But there is strong presumptive evidence that in some at least of the Fenestella and Glauconome we may discover—either by inflations of the cells, or by gibbous masses clustering round the cell mouths, indications of one of the modes of reproduction prevalent among the carboniferous polyzoa. For specimens of these gibbous masses I have sought

* Dr. Carpenter, 1868.

† Hincks's "Contribution to the History of Polyzoa."

‡ See Dr. Carpenter, p. 578-9, "Quarterly Journal of the Microscopical Society," vol. xiii.

§ Dr. Ord, M.D.

very earnestly amongst my material, and I have been rewarded by finding some surrounding the cell mouths—others attached to the spiniferous processes of *Fenestella*, and some few attached to the spiniferous and infertile branches of *Fenestella* and *Polyzoa*.

To the *Fenestella* other small processes were attached, and wherever they exist they are generally developed, but not always, on the margins of the frond. Some of these are of a spine-like, or rather of a hook-like character: and these hooks are always turned towards the margin whence the processes are developed. On other parts of the polyzoary—some-

of recent polyzoa—as was served by *Palæocoryne* in the ancient group.

The reproductive history of *Fenestella* generally seem to me to follow any co-ordinate type of the genus. The same character in the cell, the same idea prevalent in the *Palæocoryne* and in the spiniferous and infertile branches, and the same character of the bifurcations exist in one species as in the others; but there are certain peculiarities about *F. plebeia* that are apparently absent in other forms.

The corallum (or polyzoary), says M'Coy, was flat, expanded, and fan-shape; thickly carinated

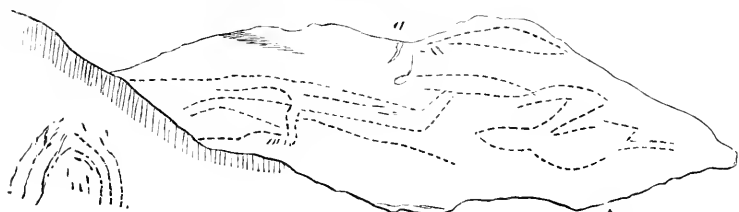


Fig. 42.—Vertical and horizontal section of shale containing *F. plebeia*, M'Coy. Natural size.

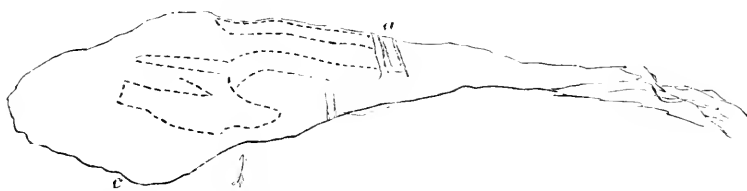


Fig. 43.—The broken edge of Fig. 42, reversed; the ↑ refers to the continuation on the same plane of the polyzoan—slightly different at c.

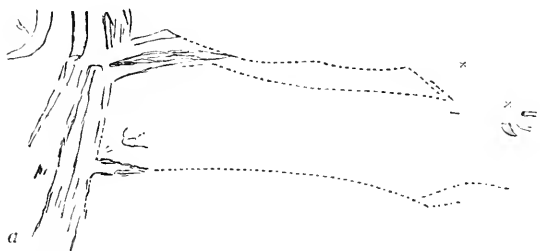


Fig. 44.—Enlargement of infertile roots and branches as at a in both figures, at x, *Palæocoryne*, and infertile processes are developed, pointing upwards. Branches and root-like process slightly exaggerated.

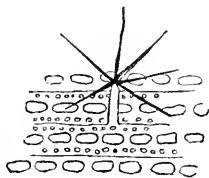


Fig. 47.—Diagram of *Palæocoryne*, showing that the *Fenestella* cells are continued along the base of the processes, and are not covered up by them. (By Mr. John Young.)

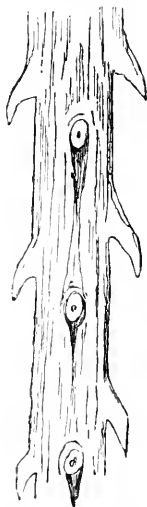


Fig. 45.—Spiniferous branch of *Polyzoa tuberculata*. (Hairyrcs.)



Fig. 46.—Sketch of branching spiniferous process on frond of *Fenestella*, from Craighlen-Campsie, Scotland (four times natural size). By Mr. John Young.

times in the front, sometimes on the back, other processes are developed, of a character altogether different from these spiniferous branches. These are the *Palæocoryne* both *radiata* and *Scotica* of Duncan. Singularly enough these have been placed among the Hydrozoa, and characters given by him to separate parts altogether at variance with the facts. *Palæocoryne*, however, are unique appendages, and they indicate another method of reproduction—peculiar to the fenestrate forms of polyzoa found in the palæozoic rocks. Neither the appendages of *Bicellaria tuba*, nor the anomalous ones of *Bimera* in any way resemble—or serve similar purposes in the life-history

interstices, with thin and regular dissepiments. The fenestules were equal and rectangular, from two to three times as long as wide, with a width equal to that of the interstices. There are four or five cell pores to length of fenestule, with slight prominent margins, about the diameter of the cell apart. The reverse of the interstices are minutely granulated, and very coarsely sulcate longitudinally.

I have before me the fragments of a slab of carboniferous shale from the polyzoa beds of North Wales (fig. 42). It is about four inches square, and the average thickness is about one inch. The specimen was sent to me by my friend, G. W. Shrubsole,

character. On breaking my own across the middle and otherwise mutilating it, I was let into the secret of *Fenestella* growth, for I found on the broken sides evidence that I have long sought for, and much more than I ever expected to obtain.

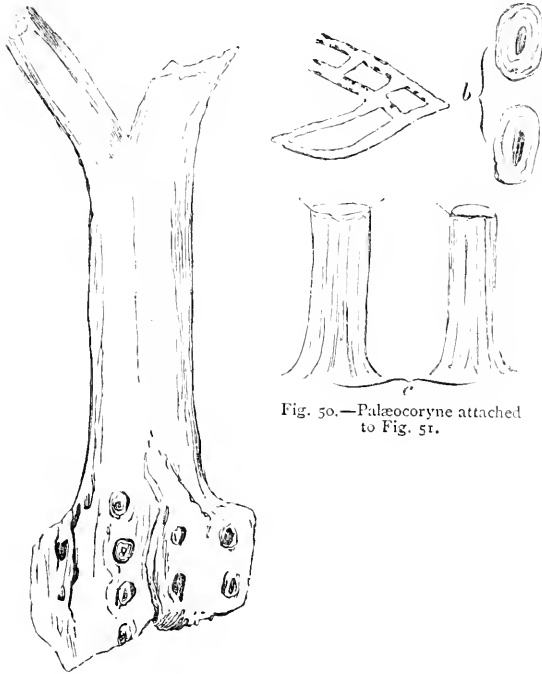


Fig. 48.—Infertile branch of *Polyzoa tuberculata*. (Prout, Hairmyres.)

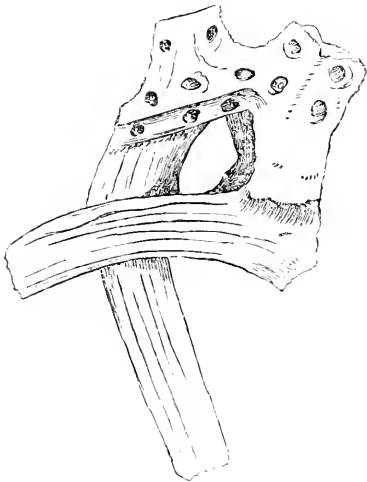


Fig. 49.—Infertile branches of Messrs. Young, peculiarly developed on the margin of a *Fenestella*, from Hairmyres. (My own cabinet.)

F.G.S., and he had in his possession a slab even larger still, but unfortunately he has failed in other visits to the district of obtaining more of the same

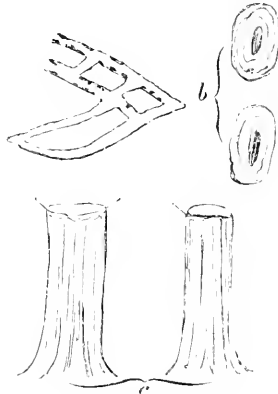


Fig. 50.—*Palæocoryne* attached to Fig. 51.

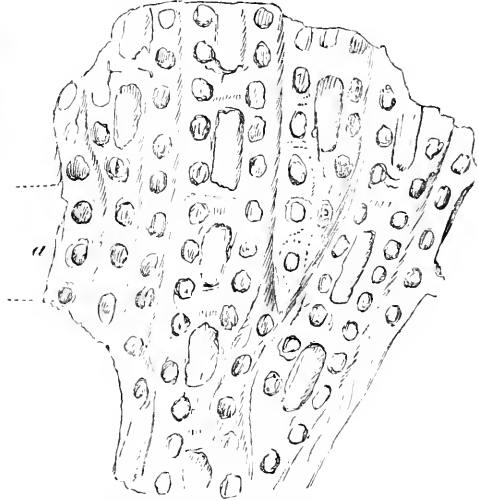


Fig. 51.—*Fenestella plebeia*; showing the interrupted development of the fenestrae; the entire absence of fenestrae at *a*, on face on the back are partially developed fenestrae of the character shown at *b*. Previous to being slightly rubbed down, *Palæocoryne* were attached of the shape and character of *c*. (In my own cabinet.)



Fig. 52.—Processes from side of *Fenestella*. (Mr. Shrubsole's collection.)

The general idea of *Fenestella* growth is, that it was either cup-shape or flabelliform, springing from a rooted base similar to the recent *Retepora* or the *Gorgonia*. My belief is that this species at least was recumbent in habit, and that it began life on some fixed spot, and that from this point it gradually spread over the soft muddy bottom. Its development in one continuous plane, in either large or small fronds, was dependent upon the quantity of sediment held in solution by the waters above. If the water was tolerably fine and free from much sedimentary matter,

the fronds of *F. plebeia* would be correspondingly large; but if the waters were surcharged with fine mud-like particles, like the Welsh shales, then these, falling upon the recumbent life form would soon bury itself out of sight. In the one case the frond would be perhaps from three to five inches square, in the other perhaps not more than one inch. The mystery of development is apparent in this recumbency, and we have no better example of the battle of life in the whole palæontology of the older rocks than is to be found in the life history of these palæozoic polyzoa.

During the last twelve months I have examined a vast number of the fronds of *F. plebeia*, and I find everywhere that the inequalities of the surface add to the grace of the Fenestella. Here there is a dead Productus,* there some fallen encrinural stems, imbedded in the mud. Over these the delicate polyzoa weave their beautiful polyzoary, adapting themselves gradually to all the undulations of the surface. Not, however, passing over the shell or the stem with that sharpness or splint-like character which would exist had the polyzoary been developed in an upright position—but delicately weaving their network even into the angles formed by the rounded stem as it lay in contact with the bottom. In no place is the polyzoary doubled upon itself so far as I am aware.

In figures 42 and 43, I have given an outline of the fractured shale of the natural size of my specimens. The continuous outlines are the shape of the block, while the dotted ones represent the exposed edges of the Fenestella. The marks in both figures are parts of the same polyzoary on the same plane, only one represents the right-hand fragment, while the other is the left-hand fragment reversed. There is a slight difference in the one that is not found in the other (*c*, fig. 43). At *a* in the two figures there are infertile processes of a root-like character, enlarged in fig. 44 to show their connection with layers of the polyzoary on certain planes. The character of these root-like processes will be considered further on. At the upper surface at point *a*, fig. 44, Palæocoryne is developed on the under part of the frond, and the poriferous face just at this particular point is much confused in character; portions of the branches, with several bifurcations, turning towards each other and meeting in a rounded form at the top. This, however is a peculiarity at this one point only, otherwise the frond is amply and admirably developed on other parts of the same plane. Here, at least, Palæocoryne serves the purpose, not only of the supporting of the polyzoary, but actually of passing over the reproductive power from one stage to another higher up, producing the uppermost dotted portion of the frond at *a* in figs. 42 and 43. From the peculiar character of *F. plebeia* at this point, I am inclined to the belief that this is only one of many points where this energy

exists on this particular plane. There was a disturbing cause, and this too has left its stamp upon the shale. A large productus settled down upon the polyzoary, burying a portion of the frond and forcing by its unpleasant presence either death or new development upon the polyzoa.

By the possession of these singular appendages, Palæocoryne, the colony was saved from destruction and development was carried on a stage higher up. In another piece of shale I have specimens of *F. plebeia*, on two planes. Here *Productus longispinus* is the original tenant, and where Palæocoryne passes over the life form from the lower to the higher, no confusion whatever takes place in development of the polyzoary; and in another specimen where there is no disturbing influence the frond, or rather the polyzoary, is beautifully developed, with that flat, expanded fan-like character noticed by M'Coy in his description of the species.

By the careful measurement of the exposed sections of Fenestella by the compass, on fig. 42, I obtain a length of about fourteen inches, and this multiplied by three, which is considerably less than the average, gives a surface of about forty-two superficial inches—an idea of Fenestella growth altogether different from that generally entertained as to the capacity of the genus.

Many of the earlier of Mr. Shrubsole's Welsh *Fenestella plebeia* I was inclined to place under the descriptive character of Phillips' sp. *F. flabellula*; but as specimen after specimen began to show characters altogether different from Phillips' diagnosis, I declined to place any more with that species. After breaking up my shale, I forwarded a small portion of it to Mr. John Young, F.G.S., of the Hunterian Museum, Glasgow, and he kindly identified the specimen as a fragment of *F. plebeia* (M'Coy). He also stated in his letter (July 7, 1878), that "It would be an interesting point to prove, in a satisfactory manner, that Fenestella and other kindred forms of fenestrated polyzoa grew in a recumbent method over the carboniferous old sea bottoms. One would be inclined to think, that from the small size of the roots compared with the large size of the fronds in many of the species, that the recumbent method was their natural way of growth." So far as I am acquainted with the subject there is no literature extant respecting this idea, and I believe Mr. Young is equally ignorant of any. The description and the figures of my slab will be, I believe, sufficient to prove the habit of the species, and any doubt respecting the true interpretations of the facts can be satisfactorily corrected by a reference to the fossils which I shall continue to keep in my possession.

I shall now take Palæocoryne in all its stages, and endeavour to identify the whole as generative processes of the fenestrate polyzoa.

Attercliffe, Sheffield.

(To be continued.)

* Longispinus.

ON THE MARKINGS AND OTHER CHARACTERS OF BRITISH RAPTORES.

AN inquiry at p. 281 in SCIENCE-GOSSIP for December suggests that a few remarks grounded on observation of several species of hawks may not be unacceptable to young ornithologists. These birds being now rare in most districts, opportunities for inspecting recent specimens are not common.

The first description, referred to, seems to relate to a kestrel; the second—wanting an important item, viz., size, may concern a sparrow-hawk—but is too vague to support a reliable opinion.

Peregrines, hobbies, kestrels and merlins have long and pointed wings, the first or second quill being longer than others; they have also “the falcon’s tooth,” a process jutting downwards from either edge of the upper mandible.

Sparrow-hawks, which Markham and the *religieuse* of St. Alban’s would have included with the goshawk as short-winged, have the fourth primary longer than the fifth, which exceeds the third, giving together rounder outline of wing and more lapwing or partridge-like flight. Sparrow-hawks, and the long-winged harriers, have a waved side edge to the upper mandible, the convexity being downwards and placed nearer the base than is the tooth of the Falconide, that forms their substitute for it.

Most hawks have increasing tendency to exchange dark shades for lighter tints, and the males of several species to assume a distinctly grey colour instead. Not only do individuals of the same species differ from others of like age, but do so themselves at different ages, and much confusion has thus been caused.

The female kestrel, and, if I remember, the young of both sexes, at first, exhibit a warm foxy brown of back, head and tail, the first part being freely sprinkled with black triangles. A long tail projecting more than an inch beyond the folded wings is barred all down; the halves of such dark traverses are not, however, exactly continuous with their fellows on the opposite web. The ground colour, in front, varies from a dirty white or yellowish grey to a rufous tinge; the breast markings on this are narrow, vertical, light reddish-brown splashes or streakings; below, these sometimes run together and expand, after the semblance of knotted cords, like the markings on the blue butterfly’s scale.

The kestrel’s head is elongated and flattened on the vertex; the beak is blue with black tip; the base being wide with yellow cere across it; behind this are many bristles. The eyes are large, dark and soft, with yellow edges to the lids. The slightly larger female after moulting retains her peculiarities, but the male gradually acquires a pretty lavender of head and pole finely streaked with vertical black lines; the back is then a richer cinnamon and with fewer black patches; the tail grey, with often only one bar; broad, terminal, and edged below with white. If,

however, the tail feathers be spread, remains of barring may, perhaps, be found distributed irregularly and chiefly, or entirely on the inner webs—one single spot in several may be seen. A very fine female, in the writer’s possession, has the ground colour of the tail approaching a faded grey, the marks much paler than usual, and the back cinnamon almost as brilliant as that usually seen in males. Well-padded, strong, feet are shorter proportionately than those of other falcons, the sparrow-hawk or harriers; and so are the tarsi, except those of the peregrine; the talons are straighter and shorter than in the species just mentioned; weight, male about 6½ ounces, length 13-15 inches, spread 27 inches. The much heavier female sparrow-hawk is, at least, an inch longer from beak to tail, but little wider of wing.

Young peregrines show a warmish but less red brown, and their breast markings, at this age, are mostly vertical and of the same hue; subsequently these are replaced by much darker, horizontal, chevron-like, traverses on breast, abdomen, and on under wing coverts—but quite the upper streakings pass into flask or tear-shaped spots, both becoming fewer and lighter with advancing age, until the breast shows nearly snow-white, a prong of which partly encircles the throat, gorget fashion—above the ends is a dark patch streaming back from either angle of the mouth; this peculiarity is more or less observable in other falcons. The mature, but still young, peregrine has the head, back and short tail of deep slate colour, closely blotched with bluish black, which at a short distance masks the general colour; both become lighter. The closed wings reach almost to the end of the tail, which is so folded that a sort of channel down it appears anteriorly. A fine female weighed 2 lb. 9 oz., measured 19 in., and spread 42 in. The flesh was hard and very red, the heart large and thick, the ligaments, aponeuroses, and tendons were tough; the feet very long, tarsi short and strong; the back toe and claw terrible. This bird was shot stooping at pigeons near a harbour mill; White’s description and Morris’s illustration tally closely with it. The only supposed Iceland falcon I recollect to have seen was higher, with longer neck, legs and tail, the latter extending much beyond the wings; the beak was carried further out and pinched in at the setting on, whereas that of the peregrine, expands widely there. The feet of the hobby and merlin have the relative length of a peregrine, but not the stoutness. The hobby’s wings reach quite to the extremity of the tail; the facial patch is well marked; the breast streakings are bolder, broader, and darker than those of the kestrel or merlin; the tail of the latter is long, passing an inch or an inch and a half beyond the wings, and is barred freely with light-coloured traverses, they and the interspaces being nearly of equal width. The female is larger than the male; the brown colour is lighter than that of the sparrow-hawk, but less red than the kestrel; the

male, like that of the hobby and sparrow-hawk, becomes dark grey above and behind, with reddish sides of neck and breast. The merlin may be known in the air by exceedingly rapid, unswerving, pigeon-like, headlong flight, and by small size, and, when seen more closely by the falcon tooth, warm but not red brown and long tail, with numerous orange-brown traverses. There is greater difference of size between the sexes of sparrow-hawks than is the case with kestrels or merlins.

The sparrow-hawk's shanks are long, and the toes also ; the former being, in the female, $2\frac{3}{4}$ inches long, the middle toe $1\frac{3}{4}$, the back one $\frac{5}{8}$ th, and far stouter

it is wanting in the falcon tooth, and somewhat in strength of foot and leg. The young marsh harrier, or moor buzzard of Bewick, who gives an excellent representation of it, is of a deep brown, the colour of a dark brown red game pullet, but with some feathers laced at the edges by a lighter shade. The head alone differs in colour, and with a dirty yellowish-white cap. The beak is carried out and long, the feet strong, and the general aspect ferocious. The hen harrier has a slyer and more perky, softer look, with a distinct owl-like facial fringe or whisker ; tall, long-legged, and upstanding, it has a long tail reaching far below the closed wings ; the plumage is rusty



Fig. 53.—The Kite (*Milvus regalis*).

than the others. The long tail has a few dark bars carried straight across both webs, or meeting with a slight angle that looks upwards. The breast marking, and those of the abdomen and under wing coverts, are very similar to the peregrine's chevron, but lighter in colour. As the male gradually becomes greyish, with a reddish breast, the female adopts a softer brown and paler traverses ; she has always a sufficient scowl, very different from the haughty aspect of the peregrine, hobby or merlin, or the wistful pensive look of the kestrel. Of three harriers one approaches the buzzard in appearance ; another, owls ; the third, in some respects perhaps, more nearly the kestrel, that is in lightness and length of wing, but



Fig. 54.—Sparrow-Hawk (*Accipiter tringillarius*).

and mealy, reddish or darkish brown, broken or streaked ; the breast has vertical splashings ; tail traverses, and interspaces are pretty equal, and perhaps mingled with white ; a show of this on the tail coverts has procured the name of ringtail, assigned by Bishop Stanley to the goshawk. The

vertex is round, and the head wanting in the length and breadth and over-hanging brows of the peregrine or kestrel. The spread of harriers is very considerable ; I regret to have mislaid my own measurements. Colonel Montague's harrier, presumably the blue-hawk, with which the observant old naturalist of Selborne was acquainted (for he separately describes the peregrine sometimes thus styled), is an altogether lighter and more elegant bird ; long with weaker feet and beak than those just spoken of ; two Montague's harriers in the writer's collection differ much in colour ; one has a decidedly rufous breast and dark plumage, richer and warmer than that of the female sparrow-hawk, and having here and there bright orange lacing to feathers ; the other is larger and

paler with dirty white breast and sparsely covered with long and wide tongue-shaped light *red* splashes, base upwards; this bird had, when spread, a very mottled appearance of wings underneath, caused by external marking showing through and barring the silver grey beneath.

The talons of harriers or sparrow-hawks, who are rather snatchers and pouncers, than swoopers and strikers, are proportionately longer, sharper, and more curved than those of most genera, but not so stout. The beaks of harriers, like those of buzzards, do not at once bend downwards, gradually forming a curve, but at first project outwards. They are narrower at

was represented in the wholesale massacre at Glen-garry which Colonel Knox records—and may yet be found in Scotland and Ireland as well as in France and Germany. I have never met with it.

The three species of buzzards, also of large size and far less active than falcons, are occasionally seen; the honey-buzzard in dense woods. Two specimens of the rough-legged buzzard have come under my notice in three years, one at Arundel, and the other twenty miles west in the extreme south-west angle of Sussex. Feathered tarsi mark the species; one was much greyer on the back, and altogether lighter-coloured as well as smaller than the other, killed in October,

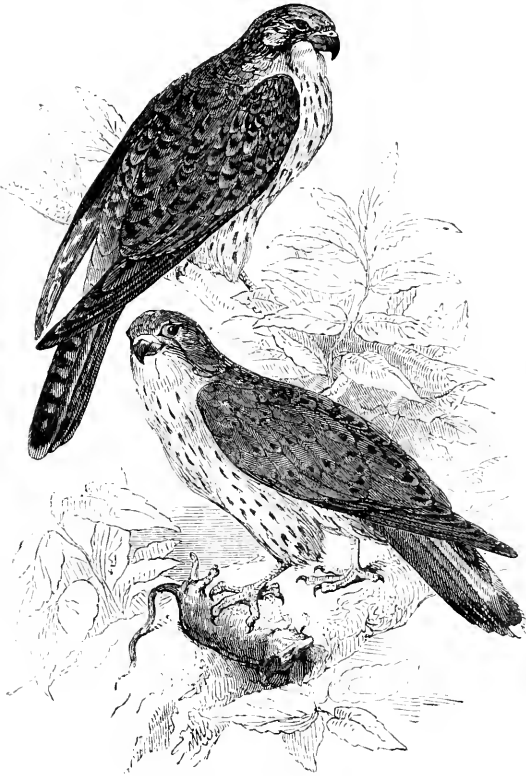


Fig. 55.—Pair of Kestrels (*Falco tinnunculus*).

the setting on than those of true falcons, but make up for this by greater depth—bristles and feathers at the base somewhat hide this part, but a side view reveals the true proportions. The harriers I have seen were chiefly obtained from uninhabited marshes of the shore line. The males of two species, at least, turn to a bluish grey, with much white underneath and in front. I have seen one such example, and heard of two; but in England this condition is now very rare. The goshawk formerly used for hawking in wooded places is still, it is said, much employed in India and China, &c. This large bird appears to have breast traverses, with dark brown back, &c. It

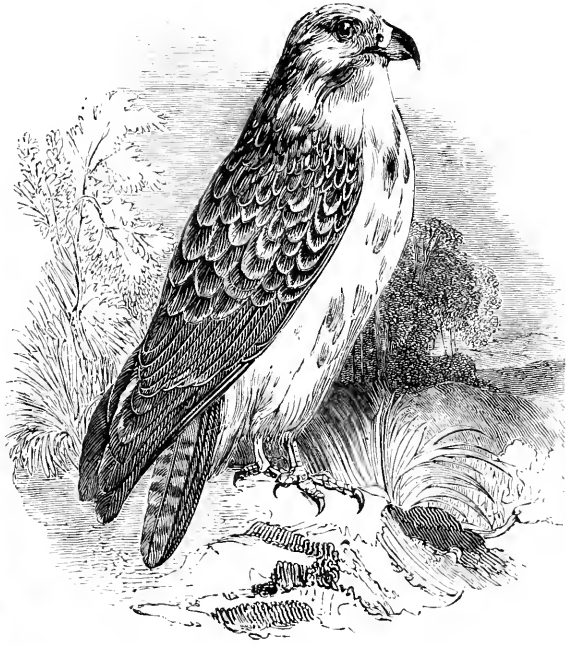


Fig. 56.—The Buzzard (*Buteo vulgaris*).

1876. The latter measured twenty-four inches, was dark brown upon a lighter shade, giving large dark splashings on back and wings; tail whole brown, except at the sides towards the base; wings length of tail; head and neck showed lighter vertical streakings, and the breast more; dark upon a light reddish dove ground; much vulture-hocked, with light brown feathers having fine dark streaks, legs closely feathered, with the same pattern; beak and claws large, dark brown feet.

The common buzzard, it is stated, is rarer than the others. The Rev. H. D. Gordon, of Harting, has recently published a most interesting history of that neighbourhood, associated with many historical events, and Mr. Weaver, a resident gentleman, has added a very complete flora and fauna of a wild and beautiful district. This informs us that the common

buzzard is more often seen there than other species. Several specimens killed at that spot, within a score or two of years, are powerful, ragged, savage-looking birds, with broken, grey and white plumage, and tails considerably longer than the wings; no two were alike. The long forked-tailed kite has disappeared from the South of England, to the great satisfaction of all concerned in rearing young poultry, game, or pigs; these never being safe when once discovered by that audacious thief.

M. O. H.

ON MOUNTING AND PRESERVING THE LARVÆ OF BUTTERFLIES AND MOTHS.

WILL you allow me to describe my method of mounting and preserving the forms of the various moth and butterfly larvæ? What I have to say may perhaps be a help to some; or induce others who know a better plan to communicate it in return.

For the last three or four years I have been working out my own in my leisure hours; and, considering that I have been totally unaided, I think I may say that I have been tolerably successful. After seeing Lord Walsingham's fine collection of mounted larvæ at the Entomological Show held in the Royal Aquarium last March, I made up my mind to write to SCIENCE-GOSSIP on the subject. For I have long felt that our collections would be greatly increased in value and attractiveness by the addition of a nicely-mounted larva to each specimen of the perfect insect. The apparatus required is very simple, consisting only of a glass retort holding about a quart, a foot length of india-rubber tubing about the size used for babies' bottles, a small piece of glass piping, and some dry straws of different sizes. Into one end of the india-rubber tubing fit a portion of glass pipe so as to make a mouthpiece: this we will call our blow-pipe. Then secure a well-grown caterpillar; which must be at least a week off the stage of becoming a pupa, for when that change is about to take place an amount of white fatty matter adheres to the skin, which it is almost impossible to get rid of, and which, if left there, spoils the preparation. Place this larva in a box and some chloroform or benzole with it; but take care neither of them touch it; having first covered the inside of the box with blotting-paper all round to absorb any of the dark green matter which often exudes from the mouth of larvæ when irritated or alarmed. When the grub is quite dead and slightly relaxed, take it out of the box and place it upon a sheet of blotting-paper, and gently pass a roller, made of a common pencil covered with blotting-paper, down from the head to the tail. By this means the entire contents of the creature may be expelled per anum without any damage to the skin. Next select a straw about the size of the opening through which the contents were discharged, and pass it into the

body a short distance, and there fix it. This may be done by passing two small pins at right angles to each other through the extremity of the tail of the larva and the inserted straw, and then adding a little gum or glue round the skin of the caterpillar where it touches the straw on the outside which will make the whole air-tight. Now that you have your caterpillar fairly fastened on one end of the straw, pass the other end into the india-rubber extremity of your blow-pipe, and fix it there by a slight ligature. Putting the glass end to your mouth, blow gently into it, and you will inflate your larva, which will at once assume its natural shape, provided only it is not distended too much. Then light your Bunsen burner, and having moderately heated the retort, hold the larva thus inflated in the hot air of the retort till it is perfectly dry. Especial care must be taken that it is neither over-heated nor imperfectly dried, or before long the skin will become wrinkled or pitted. Now clip your pins off close to the straw and cut away the straw at the end of the caterpillar's tail: and your work is done. And if you have gone through all these stages carefully, it will be done very satisfactorily too, for the larva will be found to have lost little or no colour and to be in a very natural position. There is no need to trouble oneself at all on this last point, for each will assume that which is most natural in its own state of rest. The greatest difficulty I have experienced has been the preservation of the colour in the case of the light green ones, and I believe it to be impossible without the aid of some colouring matter or dye. For their colour is not in the skin, as appears from the fact that, as soon as they cleared out by our roller, the skin is no longer green but of a whitish hue. It had always been a great object with me to preserve their colour, and I looked upon its reproduction by means of paints as an illegitimate process, but I have been at last compelled to think it indispensable.

In the case of hairy sorts the utmost care is required to avoid destroying the hairs. But provided the grub is not too near casting its skin you may generally manage this by proper precaution.

I now think I have stated all that is necessary to the perfect carrying-out of my process.

I may, however, mention in conclusion one other way of securing the colours of the light green specimens; and that is by filling the emptied skins with strong alcohol coloured by dyes. The alcohol hardens the skin and colours it from the inside, which is more natural than if the colour were laid on externally.

WILLIAM BREWSTER.

NATURAL HISTORY CLUBS.—If any of your readers should have experience in connection with village Natural History clubs, or Botanical clubs, they would confer a benefit upon certain persons desirous to form such a club if they would kindly send a brief statement of the most advisable method of conducting them to *W. L. B., The Rectory, Pulborough, Sussex.*

THE POLECAT (*Mustela putorius*).

ONE morning during the past summer, I was taking a stroll before breakfast, when, going down a "shady lane," I was amused by one of our sturdy villagers shouting out as loud as his famous lungs would permit him. "A fitchett," "a fitchett," "a fitchett just gone down the marsh." Thought I, what can the man mean? Acting upon the thought, I stopped him to inquire, when I was roughly answered, "A fitchett dunno' ye know; well, then, I canna' tell ye." Of course, all this was excused, for my friend was quite wild with excitement. Scarcely knowing for the moment what to do, I did what I conceived to be the best, joined in the eager pursuit, along with a score of lads and men, as fast as our legs could carry us. At length panting, and out of breath, I jumped with the rest over a five-barred gate, and entered a meadow to find my fellow villagers pursuing



Fig. 57.—Polecat (*Mustela putorius*).

a dark looking animal along a thick edge. Before proceeding further in my description of this Cheshire hunt (you know we are noted for hunting in the cheese-making country), permit me to add by way of excusing my conduct, in joining in the chase, that I was really anxious to know what a *fitchett* was. It might be a large animal, just escaped from a strolling menagerie, so it was important that the village should be speedily free from its presence.

However, I at length caught a glimpse of this intruder on the peace of our quiet village. It was a long and elegantly shaped animal, of a rich black colour along the back. The chase continued with considerable excitement for almost half an hour. The animal had the advantage over its opponents, by being sheltered with the thick hedge bottom—it dodged first to one side, then to the other, until it was evidently weary; then making a spring for liberty

and life, it was most humiliatingly held fast with a large shovel tightly laid over its loins. The next question was, should it be at once killed or preserved alive? The majority voted for a kind treatment, so a boy was despatched to the nearest farmhouse for a bag, in which to carry it safely. To make a long story short, we soon had our captive in a large barrel, where it was kept for a few weeks, until it was purchased by an exhibitor.

I learned what I wished to know when I 'leg or nothing' joined heartily in the hunt. The fitchett was a polecat, an animal not at all common in this county, and I gained my knowledge, not by hearsay evidence, but by my olfactory nerves, for no sooner was the captive held tightly under the labourer's spade than we were regaled by a most horrible stench. Talk about bone-works in active operation, it is a pleasant perfume when compared to the polecat! Another point was learned. The habits of this animal in captivity were so similar to the ferret that I have now no doubts the latter animal is a domesticated polecat. Of course, by continued breeding in-and-in, to use a live-stock phrase, it is now weakened, as well as puny, compared with its original parents from the "wild wood."

I account for the common or local name "*fitchett*" from the fact that the long shining hairs are used to manufacture the brushes used by artists, under the name of *fitch*, or *fitchet*; we thus perceive the name is not far-fetched. The colour of the polecat is a deep blackish-brown; the head, tail, and feet almost black; the under parts yellowish, the ears are edged with white, with a whitish space round the muzzle. The hair is of two kinds,—a short woolly fur which is pale yellow, or somewhat tawny, and long shining hairs of a rich black, or a brownish-black colour, which are most numerous on the darkest parts.

For the unpleasant odour exuded from the animal, we find a pouch, or follicle just under the tail, which emits a yellowish, cream-like substance, of a very fetid odour; this is particularly strong when the polecat is excited or irritated. It is an active little animal, scarcely ever idle, and never still, except when it is asleep, and it is one of the best friends a farmer can have about his premises, if he can keep it away from the hen-roost, for it is very partial to poultry, and commits great destruction if the game is plentiful. It destroys the latter solely for the brains and blood, for the birds are never torn or mangled. It is however, indefatigable in its pursuit of rats, and its presence in the rickyard is quite sufficient to drive away all the vermin.

Another local name for the polecat is "*foumart*," by many supposed to be a corruption of *foul marten*, in allusion to the odour it leaves behind. From its

long, agile body and bushy tail, it bears a close resemblance to the weasel and stoat; thus it is sometimes referred to the same genus.

It also has the same pugnacious disposition as the weasel, for we have a record from Delamere Forest of a fierce encounter betwixt a female and a game-keeper. It appears the man had taken its young to destroy them, when the mother came too quickly on the scene, and attacked the keeper. The fight continued nearly an hour: the polecat came off victorious, for it escaped with its young, but the man was led home blinded, and with his features lacerated in a dreadful manner. Our hunt ended far more happily, for we secured the poor "*fitchett*," which has furnished us with the text of the present narrative.

R.

ON THE STAMENS OF *SPARMANNIA AFRICANA*.

SPARMANNIA AFRICANA belongs to the Tiliaceæ, or Lime-tree order, this genus being a native of Southern Africa. It grows there as a small shrub, one foot or eighteen inches high, with coarsely serrate, downy, heart-shaped leaves, and umbels of handsome white blossoms. Each flower consists of an inferior polysepalous calyx of four white silky sepals, a hypogynous poly-petalous corolla of four white petals, numerous hypogynous red and yellow stamens, forming a globular bunch, in the midst of which is the style, rising from a superior many-celled pistil. The carpels are studded with tuberculated hairs, very much like the glandular hairs of the stinging nettle, but without the curved tip. The pedicels exhibit a peculiarity which I do not remember to have seen elsewhere. About one-third of an inch from each flower there is a joint, not very conspicuous, but still easily seen, where the flower-stalk gives way on being pulled.

But the stamens form the most interesting part of the plant. I have figured a few in order to convey a better idea of their structure, by which it will be seen that their filaments are more or less enlarged by growths which sometimes take very fantastic shapes. Puzzled at first to know what could be the use of these formations, I not unnaturally expected to find that they were in some way connected with the

process of fertilisation; but it was difficult to see how this could be so, and moreover the great diversity of form in the irregularities seemed to negative such a supposition. On a closer examination, however, and on sketching the stamens, I am inclined to think that this is a case of abortion accompanied by an extra formation in consequence of such abortion; that is to say, that the anther being in many cases absent or imperfect, the energy of the stamen, diverted from its usual object, has spent itself instead in this unusual manner. To this conclusion I have been led by observing that the extent of the malfor-

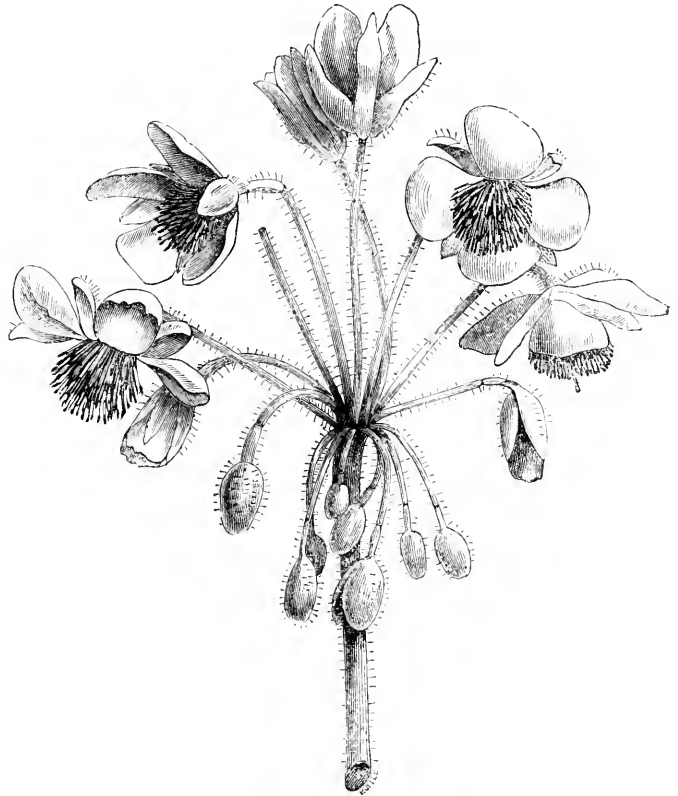


Fig. 58.—Flowers of *Sparmannia africana* (natural size).

mations varies in the different stamens just in proportion, roughly speaking, to the abortion of the anther; and also that the outgrowths are largest at the end of the stamen where the anther would have been, and diminish in the other direction. That this is the case will appear from the specimens figured, which are fair examples of the rest. The antheriferous stamens occupy by far the larger portion of the group, being found in the centre around the style; while the abortive stamens are found towards the edge of the group, forming a ring around the others. The latter are comparatively short and are entirely yellow, while

the former are longer and bright red for the upper two-thirds of their length; the two kinds merging gradually into one another. This position of the abortive stamens is just that in which they would be of least use to the pistil even if they had anthers,

A NOVEL AIR-PUMP FOR REMOVING AIR BUBBLES IN SLIDES.—A is a frame made of wood or metal; B is an india-rubber pipe; C is a valve made by closing one end of a piece of glass tube, and then drilling a small hole as shown in D, then slipping

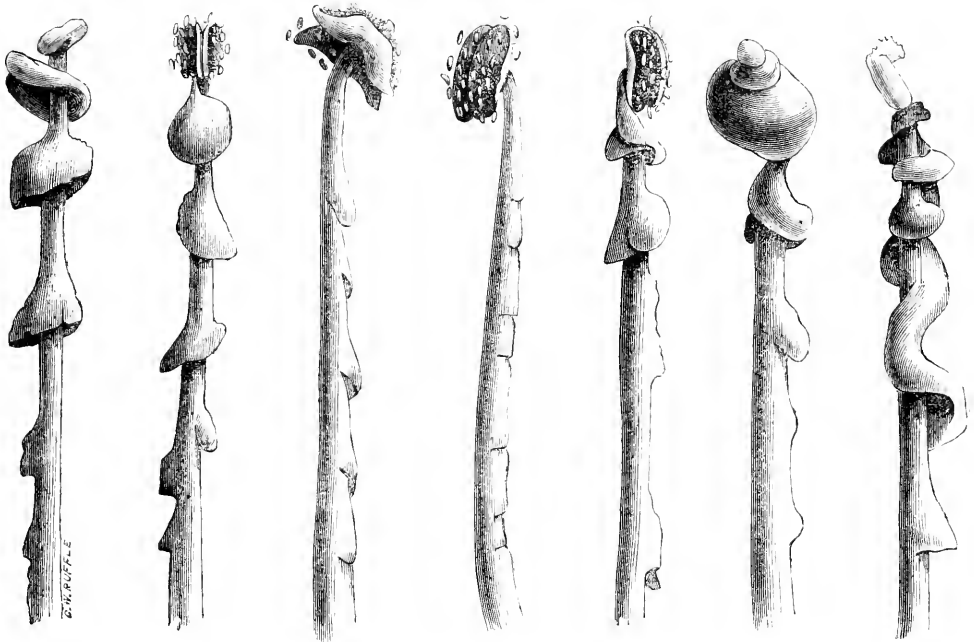


Fig. 59.—Stamens of *Sparmannia Africana* (magnified 15 diameters).

supposing the flower to be self-fertilising; while it is also here that the stamens would be most likely to undergo metamorphosis into petals.

As one might expect a flower with so many stamens to have a tendency to become double, it would be interesting to know what would be the effect of cultivation, and whether the malformation would advance inwards as the outer stamens were converted into petals. It may be that instead of becoming petals, the outer stamens would produce still more extraordinary forms.

I am indebted for the specimen I have figured to J. W. Morris, Esq., of Bath.

New-Kingswood, Bath.

JOHN W. BUCK.

MICROSCOPY.

CAVITIES IN QUARTZ.—The observations made upon the liquid-cavities in the quartz-bearing rocks of the Lake District were made from thin slices of the rocks prepared for me by Mr. Cuttall, under the superintendence of Mr. Jordan, of the Museum, Jermyn Street. Mr. Jordan has invented a special form of machine for the purpose. I would refer readers of SCIENCE-GOSSIP to my paper in the "Quarterly Journal of the Geological Society," vol. xxxi. p. 565, 1875.—*J. Clifton Ward.*

over it a small piece of india-rubber tubing as shown at C. The top of frame A should be made perfectly true, and then coated with tallow and a piece of glass.



Fig. 60.—Air-pump for removing air-bubbles.

laid upon it. The air is exhausted with the mouth at C. I find with this handy little instrument I can get sufficient vacuum to remove any air bubbles that might have formed in my slide. Mr. Atkins, of 200 Essex Road, Islington, made my instrument, and I think he is now making them for sale.—*A. Smith.*

HOW TO REMOVE CANADA BALSAM FROM SLIDES.—I know that microscopists sometimes find it difficult to remove Canada balsam from old slides, or unsuccessfully mounted ones. I have always found the following plan a very good one: Place the slides in

an oven for two or three days, the Canada Balsam will then easily chip off with a knife, then wash them in soda water.—S. C. Hincks.

NEW FORMS OF CAMERA LUCIDA. — In the December number of the "Bulletin de la Société Belge de Microscopie," Dr. Henry van Heurck describes a new form of camera lucida, invented by D. T. Hofmann (29 Rue Bernard, Paris), the well-known optician. This camera lucida not only shows the pencil with great distinctness, but every detail of the image. Every one who uses the camera lucida is annoyed at the uncertainty that accompanies the ordinary apparatus, particularly when it is necessary to reproduce delicate details, as, for example, the markings on diatoms. With this new instrument these fatiguing adjustments are avoided, and we feel sure that it will be cordially welcomed by the micrographer. The construction of the Hofmann camera lucida will be understood by the subjoined diagram. It will be seen that it consists of *c*, a combination of lenses. The image is received by a silvered glass, *a*, and is reflected upon the second

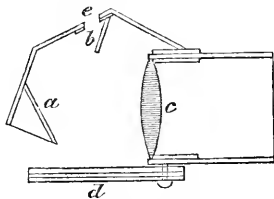


Fig. 61.—The Hofmann Camera Lucida.

glass, *b*. *e* is a small aperture, through which not only the image in the mirror can be seen, but also the pencil and paper. *d* are two very slightly convex lenses, which may be used together or separately; they serve the same purpose as those on the ordinary forms of camera lucida. The Hofmann camera lucida is really a "camera lucida ocular," the inventor intending it to replace the ordinary ocular.—F. Kitton.

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY. — Some twelve months since the Society was informed by the publishers of the "Monthly Microscopical Journal" that in consequence of that work not being a pecuniary success, the arrangement existing between them must terminate. The Society thereupon determined to follow the example of other societies and publish their own Transactions. In accordance with this resolution, the first part made its appearance in March, 1878, a part being published every alternate month. We have now before us the first volume and part i. of the second. Volume i. contains 402 pp. of letter-press, 17 plates and many woodcuts. The names of the contributors of original papers guarantee their value.

The following gentlemen have already sent papers: H. Sorby, F.R.S., &c. (Presidential Address); Carl Zeiss, Jena; Adolph Schulze, Glasgow; J. W. Stephenson, F.R.A.S.; G. G. Stokes, M.A., D.C.L. Oxon., LL.D. Dublin, &c.; Professor R. Keith; F. H. Ward, M.R.C.S.; F. H. Wenham, F.R.M.S.; F.

Crisp, LL.B., B.A. &c.; Professor Owen, F.R.S. &c.; Dr. R. Pigott, M.A., F.R.S. &c.; H. J. Slack, F.G.S.; Dr. H. D. Schmidt, New Orleans, La.; M. P. Petit, Paris; Rev. W. H. Dallinger.

Amongst the important original articles we would especially direct attention to the following, "On the Measurement of the Flagella of Bacterium, a Contribution to the Question of the Ultimate Limit of Vision," by the Rev. W. H. Dallinger (2 plates). It has been asserted that any object whose dimensions were less than a half-wave length of white light, was incapable of being seen, however much our objectives were improved in their revolution or definition. In fact, that light was too coarse a medium for objects less than $\frac{1}{251367}$ inch in breadth, that being the length of half a wave of white light; supposing the blue rays were used, the dimensions might be reduced to about the $\frac{1}{172000}$ inch without becoming invisible.

The Rev. W. H. Dallinger, with the careful manipulation for which he is so justly celebrated, has not only been able to see the flagella on *Bacterium termo*, but has succeeded in accurately measuring their diameters, and he finds that the mean of two hundred measurements is nearly $\frac{1}{251700}$ inch, being much less than a quarter-wave length of white light. Mr. Slack, F.G.S., the present president, communicates some interesting observations "On the visibility and optical aspects of Hairs viewed from a distance." He finds that a hair $\frac{1}{1000}$ inch in diameter when stretched on a pane of plate glass and viewed against a white sky, was seen by several persons at a distance of thirty-four feet, and under special conditions at a much greater distance. In the February number Dr. Royston Pigott, M.A., F.R.S. &c., has a learned and valuable paper on a similar subject, viz., "The Limits of Microscopic Vision." In this paper he very much increases the limits of visibility, but we must refer our readers to the paper itself, our space only permitting this brief notice of it. Professor Owen in his article on the microscopic structure of the fossils called "granicones" (2 plates), shows with great probability that these bodies are the dermal scutes of some Lacertian reptile resembling the recent *Moloch horridus* of Australia. Associated with these remains are the bones of marsupials. The "granicones" occur in the "Feather-bed" stratum, Middle Purbeck, Dorsetshire. Those interested in the study of the Diatomaceæ will read with pleasure M. P. Petit's description of new diatoms from New Zealand and Campbell Island (translated by permission of the author, with notes by F. Kitton). It is illustrated with two plates of figures. The notes and memoranda form an important part of each number. They are selected (and where necessary translated) from the current literature, English and foreign; the ordinary microscopist is therefore kept "posted up" in the most recent labour of foreign observers. In the bibliographical division we have first a list of microscopical works recently published (English and foreign); second, an index to the contents of the various

scientific serials, English, French, German, and American, in so far as they relate to microscopical matters; as this division occupies eight closely-printed pages, our readers well understand that it contains no ordinary amount of information. The editorship has been undertaken (as an honorary office) by one of the secretaries, Frank Crisp, LL.B., B.A. &c.

ZOOLOGY.

THE WEATHER AND THE BIRDS.—Under the above heading, a paragraph appeared in *SCIENCE-GOSSIP* for February (p. 40), in which it is stated that a golden eagle was shot at Fritton, and another seen at the same time which escaped. The bird in question was wounded and taken alive, and is now in the Yarmouth aquarium, where I saw it a short time since. It certainly is not a golden, but an immature white-tailed eagle. Individuals in the same stage of plumage occur along the east coast almost every autumn or early winter, and are as invariably recorded as golden eagles. The only authentic instance of the occurrence of the latter species is that recorded by Mr. Stevenson in the "Zoologist" for 1869, but the white-tailed eagle, as before stated, although in the mature plumage excessively rare, is in the immature dress by no means a rarity. In order to distinguish between the two species in any stage of plumage, it is only necessary to remember that the tarsi in the golden eagle are feathered to the toes, and the first joint only of each toe is covered with broad scales, whereas in the white-tailed eagle the whole length of each toe is covered with broad scales and the tarsi are bare. —*T. Southwell, Norwich.*

KILLING AND PRESERVING REPTILES.—In reply to Mr. Alfred Wheldon's inquiry, I beg to say that the best way to kill a small reptilian or batrachian is to put the animal into a phial which is of just sufficient size, together with a piece of folded blotting-paper, saturated with chloroform, and then place the bottle for a few minutes out of the sight of ladies and children. Death will speedily result from asphyxia. The specimen should then be preserved in methylated spirit, which may be diluted to the extent of, say, 25 per cent. with water. The addition of the water will very likely make the liquid thick with air-bubbles, but these will disappear in a few hours. The most convenient and inexpensive bottles are "boxwood-topped kali bottles," or, for rather larger specimens, "one pound wide-mouthed stoppered rounds." Both may be obtained of Messrs. S. Maw, Son, & Thompson, 10, 11, and 12 Aldersgate Street, E.C., or through any obliging chemist. It is not usually necessary to secure the specimen with a thread. Lizards and newts should be preserved head downwards.—*R. Morton Middleton, Jun.*

THE NIGHTINGALE IN YORKSHIRE.—As Mr. Ingleby has indicated the nidification of the nightin-

gale, *Philomela Luscinia* having taken place in Yorkshire, the following facts may prove interesting both to him and other readers of *SCIENCE-GOSSIP*. In the summer of 1877, a pair of nightingales built their nest in the shrubbery of a gentleman residing near Beverley. Of course the occurrence attracted considerable attention, and it was freely discussed in the local papers. I am glad to say, however, that, notwithstanding the general publicity thus given to this remarkable fact, the young were hatched and reared without any further disturbance than that occasioned by the pardonable curiosity of onlookers. In this they seem to have been more fortunate than the pair described by Mr. Ingleby. I may add that no further instance of this kind has occurred since in the neighbourhood, and indeed had not done so for some time previously.—*Major Lawson.*

GLYCIPHAGUS PLUMIGER.—When I announced the capture of this acarus in the July number, I had only found one specimen; subsequent search, however, enabled me to find many more of both sexes. I scarcely thought this worth mentioning, but as my silence may have misled Mr. Lambert, it is perhaps as well to do so. For the purposes of observation, I endeavoured to breed them in confinement, and have been fairly successful. I have several thriving families at this moment. I may take this opportunity of stating that although, when I first announced the capture in England of the kindred species, *Glyciphagus palmifer*, I doubted its being truly indigenous, I believe now that it is, as I have since found it where its introduction on any foreign material would be highly improbable.—*A. D. Michael.*

DIVISION OF THE PTEROPODA.—At a recent meeting of the San Francisco Microscopical Society, Dr. G. Eisen stated that the class of Pteropoda had hitherto been divided in two orders, viz., Thecosomata and Gymnosomata, the animals belonging to the former being covered by a hard shell, those of the latter being perfectly naked. He thought a better characteristic would be the presence or absence of a silicate radula in the palate. The two genera exhibited were very likely new, but seemingly related to Tiedemannia and Pneumodermon. The wings of the former genus were drawn more minutely, and especially their anterior margin was seen in a highly magnified scale. The author had here found some new organs of sense, consisting of an agglomeration of larger cells situated on a pear-shaped body of minute granulated cells. In the middle of the larger cells was to be seen a small opaque, pearl-shaped body immediately connected with a nerve ganglion. Such peculiar organs were distributed over only a small surface of the hyaline wing. The masticatory organs of this genus were situated in the stomach, and consisted chiefly of four pyramidal chitinous teeth. The same organ of Pneumodermon was seen to consist of a radula full of silicate teeth. On both sides of this

radula, and also in front of the same, were large round, or triangular bodies, covered with chitinous teeth, between which the food apparently was ground before entering between the teeth of the more delicate radula. The animals of both genera being hermaphrodites, their male and female generative organs were found to be connected in the same individual. In both genera they seemed to resemble each other to some extent, but, as could be seen by the drawings, those of *Pneumodermum* were the most complicated, as having near to the exterior porus an additional large prostate gland.

BIRDS IN NORTH WALES.—It may be interesting to naturalists to know that several species of birds, which I believe to be uncommon, have been shot up the estuary of the river Mawddack, at Barmouth, during the winter, viz., shoveller (*A. clypeata*); golden eye (*A. clangula*); red breasted merganser (*Mergus serrator*), chough, &c. I should like to call the attention of your readers to a rather striking incident which came under my notice on Saturday, January 11, whilst walking past Aberamfira Harbour. Between twenty to thirty wrens (*Troglodytes Europeus*) flew from the rigging of the "Mary Jones" (a small schooner) to the branch of an oak-tree close by. There they remained for some time, until the approach of evening compelled them to seek shelter elsewhere. Will any of your readers kindly tell whether this is a common occurrence or not?—*Joseph J. Cotton, Barmouth.*

BOTANY.

THE CULTIVATION OF MISTLETOE.—As an old and successful grower of mistletoe, I would inform Mr. Bonar that its seeds vary, commonly contain two, and sometimes three embryos. It would have been found, long ago, that nothing is easier than to cultivate this plant, had not two erroneous statements been circulated in books, viz.: (1) that the berry, not the seed must be rubbed on the branch destined for its growth; and (2) that a notch is to be made in the bark to receive it. Take the seed out of the berry, and smear it on a smooth part of the bark, and it will adhere and grow. Where the radicle comes into contact with the bark, the latter swells. No further change occurs till the next year, when the tiny plants rise on end, open their cotyledons, and emit a minute shoot. They grow the length of one internode, annually; so that the age of a bough of mistletoe is readily known.—*Martin M. Bull, Jersey.*

SYMPHYTUM TUBEROSUM, NEAR EDINBURGH.—May I venture to point out a mistake into which Mr. King has fallen, when he says with regard to *S. tuberosum*, "a somewhat local plant in the neighbourhood of Edinburgh," a larger acquaintance with our flora will convince him that, instead of being "local," it is exceedingly common in the neighbour-

hood. It is very abundant on both banks of the Braid Burn, and also on the banks of the Water of Leith through many miles of its course. On the other hand, *S. officinale* is certainly "beal" in this part of Scotland, its place being filled up by *S. tuberosum*. I have not had so much field work in the south, as in the north, but, while in England I have been struck by the absence of what with us is a "common plant." For one station for "*officinale*" I can give twenty for "*tuberosum*."—*A. Craig-Christie.*

PLURALITY OF PETALS IN THE GENUS RANUNCULUS.—I have repeatedly found, not only *Ranunculus Ficaria*, as Mr. J. A. Weldon mentions it in the last number of SCIENCE-GOSSIP, but also *R. bulbosus* and *acris* with more petals than they should have, owing to a certain number of stamens having turned into that state. Several times have I looked in meadows, where *R. bulbosus* and *acris* grow abundantly, and found specimens with from five, six, seven and so on, up to twenty. This is generally the case when the ground is of good quality. I have also met *R. flammula reptans* and *scleratus* with more than their usual number of petals, six or seven for instance. Once I met a specimen of *R. confusus* with six petals.—*T. Tempère, Manchester.*

GEOLOGY.

Fossil REPTILES RELATED TO MAMMALS.—There has lately been disclosed a large series of remains of American reptiles which appear to have been extremely abundant during the Permian age over the whole continent. This was one of the most remarkable faunas known in the history of the earth—distinct from what went before and what followed it. The structure of all the species is very complicated, but all agree in certain characters. The scapular arch, by the presence of an epicoracoid and certain other bones, forms a circle like the pelvis; and this gives significance to the name Pelicosauria, which Professor Cope proposed to give to the group. The specialised shape of the tarsus, the perforated vertebræ surmounted by tall knotted spines, and various other anatomical features have been dwelt upon at length by him. A series of skeletons of very similar structure have been discovered in the Permian beds of South Africa; but they differ from all American examples in their long sacrum, and in not having the vertebræ perforated. Owen had called these fossils therodonts, intending that the name should cover the American permian reptiles as well: but this Professor Cope considers impossible, since the American fossils are of a type distinct from the African. The two types together form an order of very high rank in the classification of vertebrates, which presents the nearest approach of any group of reptiles to the mammalia. Hence Professor Cope has designated them theromorphous. The presence

of the epicoracoid bone, the *os innominatum* and the form of the tarsus and humerus, all show the remarkable affinity of these reptiles to the Monotremata, and convinced Professor Cope that they ought to be considered the ancestors of the mammals. Yet there is no question but that they should be classed on the reptilian side of the dividing line.

PRESERVING BONES.—In answer to your correspondent, "W. G.," I beg to state that a very simple method of preserving post-tertiary bones, is to paint them with thin gum, which should be as clear and colourless as possible. This is an easy and inexpensive, and, as I know from experience, an effectual way of preserving them. It makes them very strong, and enables them to bear any reasonable amount of handling. The gum must be thin, or it will give the bones a shiny, varnished appearance. All fossils which are liable to crumble and fall to pieces, may be preserved in the same way.—*J. W. Carr, Cambridge.*

NEW CARNIVOROUS REPTILES.—Professor Owen has just identified the remains of a new and gigantic kind of carnivorous reptile among the collection of South African fossils collected by Mr. T. Bain. The name of *Titanosaurus ferax* has been given to this creature, which Professor Owen regards as of a more carnassial type than any existing carnivorous mammal.

THE GEOLOGY OF ARRAN.—At a meeting of the Glasgow Geological Society on January 16, James Thomson, F.G.S., read a paper on the "Geology of the North End of Arran." He first gave a description of the brecciated conglomerate of the Carrigills shore, and round Brodick Bay, extending eastwards to the shore below Masldon, pointing out that the views advanced by Sedgwick, Murchison, Ramsay, and Bryce, could, as regards these rocks, no longer be adhered to. He showed that the basement rocks of the carboniferous system rested upon the underlying breccias, and referred to sections exposed in Glencoly, Glensharg, and Cnocken Burn, &c., where the order of succession of these beds may be studied, and stated that beds of the same stratigraphical position could be examined in the following localities, viz.: Askoig, Bute; Millport, Cumbræ; the valley of the Griom; the Garple and Greenock waters, Muirkirk, Ayrshire; Logan Water, Lesmahagow; Lanarkshire; and Todholes, near Stirling, Stirlingshire. He then described the stratified rocks of the shore eastwards to Corrie, and referred to the limestone of that locality being charged with *Productus giganteus* and found with the ventral valve downwards, the reverse being the case in other localities for this fossil shell.

Mr. Thomson then reviewed the old red sandstone beds from Corrie to the Fallen Rocks, and described the nature of the fragments of rocks found in the breccias, near Corrie, which all were agreed was of undoubted upper old red sandstone age, and referred to the similarity of these beds to those found on the Corriegills shore. He referred to the desirability of further in-

vestigation of the Fallen Rocks before a satisfactory explanation of that extraordinary mass could be given. About fifty yards to the north of the Fallen Rocks he had some years ago discovered remains of fossil fish in great abundance in volcanic ash beds, and there also, in company with Sir Charles Lyell, discovered a tooth of *Cladodus*. The coast line was next traced to the section where Mr. E. A. Wimsch, F.G.S., made his discovery of fossil trees in the volcanic ash beds, and described in the Society's "Transactions." Proceeding northwards, a great fault is seen, produced by a broad igneous dyke, which can be traced up the hillside to the chasms seen in the breccias, on the top of the hill above the Cock of Arran. Mr. Thomson then referred to the physical features, and the fossil remains of the limestone found on the north-east shore, lists of which he had prepared to accompany his communication. Mr. Thomson then dwelt on the correlation of these marine deposits with the rocks of the same stratigraphical position throughout the central valley of Scotland. He also referred to the breccias at the Cock of Arran, and stated that they resembled those he had examined at St. Bees Head, Northumberland, and at Ballochmyle, on the banks of the Water of Ayr. Mr. Thomson then described his hunt throughout the range of rocks in the hills above the shore for fossil evidence of their age; and in these breccias he was at last rewarded by the discovery of no less than twenty-seven species of characteristic carboniferous fossils, a list of which he had prepared to accompany his paper. He was thus able definitely to confirm the conclusions of Sedgwick, Murchison, and Ramsay, as to the age of these rocks, at least to the extent that they are posterior to the carboniferous age; and at the same time to show clearly that the classification of these rocks adopted by Professor Geikie in his last published "Geological Map of Scotland" was erroneous, while the same may be said as to that of Professor von Lasauls in his work upon his studies and sketches of the Geology of Ireland and Scotland lately published.

NOTES AND QUERIES.

FERMENTATION.—Professor F. R. Eaton Lowe, in an article entitled "A Glass of Wine" in "Science for All," says, the operations connected with wine-making differ from those connected with beer-making in so far as it is necessary for the beer-maker to introduce a *ferment* into his *wort*, while the wine-maker has not to do this, because the grapes "contain sufficient nitrogenous matter in the shape of gluten, which speedily undergoes decomposition, and communicates its state of change to the associated sugar." It is certainly unnecessary for the wine-maker to introduce a *ferment*; but does fermentation take place in the way Professor Lowe says? I am under the impression that the wine-maker introduces his *ferment* unconsciously, just as sure as the beer-maker introduces his consciously. How does the Professor account for the presence in the liquid of the living

plant concerned in alcoholic fermentation? I thought M. Pasteur proved that the pure juice of the grape has no power to ferment of itself; and when he saw this he set to look for the cause of the fermentation, and found it in the small microscopic particles which stick to the outside of the berries, and even on the twigs of the vine. I shall feel greatly obliged to any of the readers of SCIENCE-GOSSIP who can tell me whether Professor Lowe or M. Pasteur is correct.—*D. M. D.*

ANEMONES IN AQUARIA.—Some of your readers may be interested in the following facts. I have a small bell glass aquarium which as a marine aquarium has been very successful, there having been no deaths for upwards of two years, and the anemones throughout have maintained a high standard of vitality, attributable, I consider, to regular feeding, aérations, and scrupulous cleanliness. Numerous young have been cast off and one stone is closely covered with what are apparently the larval form of the star fish. During this winter the anemones have been of an unusually errant disposition, and I have three times on different occasions observed what seem to be conjugations. In each case the first sign was the appearance round the base of the animal of spermatic cords, and these in some cases reach an inch and a half in length. They float in the water and that they are perceived by other anemones is proved by the animals moving up, and with their base partially covering the extended base of the first. They remain in this state for about twelve hours, the emission of the spermatic cords is increased till both are enveloped in the coils and these are perfectly visible, and between thirty and forty in number, at least I have counted as many. After some interval—about twenty-four hours from the first contact—the one that has moved up moves away, each closes and remains in a state of quiescence from which they do not emerge for some days, no matter how tempted by food or aération. I shall be glad to learn if any of your readers have noticed similar occurrences.—*G. L. B., Denmark Hill.*

MISTLETOE ON THE PEAR.—A writer in SCIENCE-GOSSIP, page 43, 1877, asks for further evidence that the mistletoe grows on the pear. Kittel, in "Botanisches Taschenbuch" and Dr. F. M. Bechstein, in "Forstbotanik," page 679, both state that in Germany *Viscum album* is found on the pear. P.S.—Withering, in "British Plants," states that *Viscum album* occurs on the Pear.—*J. A. Sandford.*

MANDRAKE (?) (SCIENCE-GOSSIP, page 166, 1878).—Throughout the United States *Podophyllum peltatum* of the natural order Berberidaceæ is known as mandrake. The fruit, when fully ripe, is sweet and edible, and weighs from 1 to 4 oz.—*J. A. Sandford.*

HEMPSEED AND BULLFINCHES.—With reference to my letter on the effects of hempseed causing the plumage of bullfinches to become black, and which was inserted in SCIENCE-GOSSIP of November 1, it would appear that under the head of "Cage Birds," in a paper contributed to the "Times" of February 1, Norwich canaries fed on cayenne pepper (a teaspoonful to one egg) have their plumage under such diet changed into a bright metallic flush—which pales at every moult. I must confess that if I possessed any pet birds, whether bullfinches or canaries, I should pause ere I continued giving either hempseed or cayenne pepper on the ground of both being too stimulating for any lengthened period. It would be

interesting to know what the opinion may be of extensive bird fanciers upon this subject.—*John Colebrooke.*

HYALOPHORA CECROPIA AT CLAPHAM.—In SCIENCE-GOSSIP, at page 46, Jas. Ives records the capture last July of a specimen of *Hyalophora Cecropia* at Clapham. He adds the rather extraordinary query, "Is it not likely to have escaped from some entomological cabinet?" Live insects are not usually placed in cabinets, nor do pinned and probably dead ones generally escape. The explanation, however, is very simple. Mr. A. Wailly, an importer and dealer in silk-producing bombyces of the Clapham Road, records in the "Entomologist," vol. xii. p. 9, that in December, 1877, he received from America an extraordinary number of live cocoons of this moth, and that a number of impregnated females which had emerged therefrom, he let loose in his garden. Some were also taken to a wood near London.—*W. L. Distant.*

CURIOUS SITES FOR BIRDS' NESTS.—From time to time, notices of birds' nests being found in strange and unlooked-for situations, have appeared in SCIENCE-GOSSIP. In the belief that a number of instances which have come under my own observation during my experience as a "birds'-nester," may not be uninteresting, I have been induced to write a short account of a few of the more remarkable deviations from the ordinary rules followed by most species of birds in their choice of a nesting-place, and which I have jotted down in my note-book whenever observed. Several years ago, I found a nest of the common thrush, on the ground, in a large clover-field, quite a hundred yards from the nearest fence. The nest was merely an apology for one, being but a few straws, collected together in a slight depression of the ground, without any attempt at lining, indeed I have seen plenty of lapwings' nests with far more materials collected about them. It was partially concealed by the young clover, which was about six inches high, but otherwise there was nothing to screen it from view. My attention was first drawn to the nest—which contained five eggs—by seeing the old bird fly off. I watched the nest closely, until the eggs were hatched, and the young ones nearly fledged; but one morning, I found that some prowling weasel or hedgehog had discovered and made a dainty breakfast of the unfortunate "throistles" as the mangled bodies of two, and the scattered feathers of the rest, plainly showed. This is the only instance I have noticed of a thrush nesting on the bare ground, away from any cover. Another thrush's nest was in an old milking-can which had been kicked about by the school lads, and finally lodged in a large thorn bush, about two yards from a much-frequented footpath, close by the village church. I chanced to throw a stone at the can when, greatly to my surprise, out flew a thrush. I lost little time in jumping over the fence, and found the nest snugly ensconced within the can, the mouth of which, being turned away from the path, prevented the nest from being seen by any of the numerous passers-by, and, as I only divulged the secret to a few trusted friends, I am pleased to say the mother bird safely reared her brood. I have found a nest of the blackbird on the branch of a tree quite thirty feet from the ground, and several nests of missel-thrush on the shelves of an old shed once used for the manufacture of drain pipes. I have also seen a nest of this species built on one of the stone walls used as fences in moorland districts. As in this case there were neither trees nor bushes within a considerable distance, I suppose the birds had been obliged to

adapt themselves to circumstances. Last year I found two robins' nests on the top of a large haystack, but they were destroyed by the stack being cut for sale. A pair of robins have, for several years, built their nest in the end of a pipe, formerly used to a stove in our schoolroom, flying in at either an open window, or a broken pane, and have generally succeeded in rearing their young. The partiality of the robin for curious nesting-places is well known, but it is surpassed in eccentricity by some members of the tit tribe, which seem to have a fancy for "camping" in the most unlikely and outlandish places; one hears of their nests being found in such places as the hat of an effigy, got up as a scarecrow; in a pump; in a flower pot; in a bottle; or in a box hung up against a wall, and I have myself found them in all these strange situations. One day, when crossing the orchard, I was rather startled at seeing a bird fly from between my legs, apparently out of the ground, and upon close search amongst the herbage, I found what seemed to be a mouse-hole. Procuring a spade I soon solved the mystery; a nest of the great tit, containing eight callow young, was built amidst the ruins of what had the year before been a wasp's nest, the inmates of which had, as I well remembered, given our household no slight trouble during the previous autumn. In the cavity formed by the wasps, and amongst the remains of their combs, the tomtit had found a snug nesting-place. I carefully covered up the hole, and believe the little bird brought up its family in peace. I have on two occasions found nests of the blue tit built amongst the honeycombs of a deserted beehive. Did space permit, I could cite many other instances of singularity shown by birds in their choice of nesting-places, but will conclude with the hope that what I have already narrated will not be totally devoid of interest to many, who, like myself, are fond of studying the manners and habits of our feathered friends.—*R. Standen, Goosnargh, Lancashire.*

BLACKBIRDS' NESTS AND THRUSHES' EGGS.—It may interest some of my fellow-readers of SCIENCE-GOSSIP to know that I have found a blackbird's nest with four thrushes' eggs and five blackbirds' in it; also a wren's nest in the roof of a thatched shed, inside, containing several eggs of the common wren as well as three eggs of the house sparrow; I have also several times found pheasants' and partridges' eggs in the same nest, but in none of these cases have I discovered which bird ultimately brought up the brood, as I regret to say in those days I used to take all the eggs I found.—*J. T. Green.*

THE CUCKOO'S EGGS.—In last month's number of SCIENCE-GOSSIP, Mr. James Ingleby states that the eggs of the cuckoo "vary very much in colour, and very much resemble the eggs of the birds in whose nests they are deposited." That this is only partially correct, despite the very high authorities by which it is backed, I am assured. I have in my collection no less than eleven specimens of these birds' eggs. Four of these were taken from the nests of hedge sparrows; all these four are of various shades of grey, mottled with darker spots, whilst those of the hedge-sparrow where of a bluish-green. One of the specimens I found in a wren's nest, along with nine wren's eggs. Here again the difference was very great, both as regards size and colour; the cuckoo's egg being brownish-grey, whilst the wren's were white and dotted with red spots near the larger end. Of the rest, two were taken from the nests of common wagtails; one situated in a pear-tree trained against a garden wall, and the other in a grape-vine in a similar situation. Two more were found in sedge-warblers' nests

about three feet from the ground. One was taken from a white-throat's nest, and the last in May, 1878, from a tree pipit's nest built in a bank at the side of the high road. In these last cases the difference was of course, not so clearly defined, but all the cuckoos' eggs in my collection are some shade of grey. In fact I have never seen but one cuckoo's egg that was not, and this was of a decidedly brown tinge. Of course, when the cuckoo lays her egg in the nest of a skylark, tree pipit, wagtail, or whitethroat, the difference is not so very great from those of the other bird. In reply to Mr. Kerr's queries, he will see that I have taken a cuckoo's egg from the nest of the common wren, which was only about eighteen inches from the ground. With the exception of the tree pipit, I found all my cuckoo's eggs in nests placed several feet above the ground. In the edition of "White's Natural History of Selbourne," edited by Mr. Jesse, the editor states in a note, page 108, "It is now known, by examination of the ovary, that the cuckoo lays several eggs." In conclusion, I would refer both gentlemen to Volume XII. of SCIENCE-GOSSIP, where the subject of the cuckoo and its habits is discussed.—*B. E. S.*

WOODPECKERS AND THEIR NESTS.—In the middle of February, 1878, I was deeply interested in a small woodpecker (*Picus minor*) which daily kept up its busy tapping on the dead boughs of some twenty poplar-trees at the end of my garden. I watched it whenever I could get close enough to see it clearly. At one time I saw a larger species fly from the top of the same tree that the smaller species was tapping on. On March 3, I observed that it had a mate with it. I watched the pair until the middle of April, when I lost sight of them until, on June 20, I saw one flying in a direct line towards the poplars, they being just within sight. I saw it a second time three days after in the same place just come from the direction of the poplars; it went over a wall; my appearance above the wall frightened it from some ivy growing on a house about ten yards distant, I believed at the time that it was searching for food, and had young up in the poplars; and on July 6 I was surprised to find that it had successfully reared its young in a hole that it had made in the under side of a dead arm of an apple-tree, only ten feet from the ground (when I had supposed it was fifty feet high in the poplars). The entrance was perfectly and smoothly made, very small, and arched over into the centre of the touchwood; the arm was only fifteen inches round; the hole was about fifteen inches deep, and recently made. The touchwood being quite clean, I carefully let a spoon down into the hole, but all was gone. On the 12th instant I paid a visit to the hole, and found it *newly* and *very much enlarged* in the same perfect manner, this could not have been done more than eight weeks, most probably had only been done a few days. A minute after this I heard the tapping up in the poplars, and searching, found my acquaintance of last year at his usual occupation; and watching it, saw it disturbed by passers-by and fly on to the apple-tree. My reason for inserting this interesting account is: can any of the readers of SCIENCE-GOSSIP inform me whether the larger species (*Picus major*) has enlarged the hole, and intends breeding in the apple-tree this season, or is it the same pair as last year? If so, why they should require a larger hole than last year, and at what date I may expect to find eggs (being a collector)? I should like to know more clearly what their tapping is for, I believe it is for two purposes.—*H. B., St. Ives.*

COLOUR OF BIRDS' EGGS.—I am afraid Mr. J. Ingleby will find it difficult to procure anything that

will answer his purpose. Varnish, of which I have tried many kinds, does not give a satisfactory result; and besides, destroys the natural appearance of the egg. I never use varnish now, but find that I can preserve the colours of nearly all eggs by taking care, when blowing them, not to allow any moisture to touch the outside of the shell; and when drying, before placing them in the cabinet, I carefully keep them *from the light*, for most eggs when newly blown, more especially those of a blue or greenish colour, and many of the hawk's fade more during a few days' exposure to the light, than they would in as many months when placed in the cabinet. Light should also be carefully excluded from the specimens in the collection. I have had few "faded" eggs since I adopted the above plan, six or seven years ago.—*R. Standen, Goosnargh, Preston.*

INTELLIGENCE IN MAN AND ANIMALS.—The settlement of the question raised by Mr. H. D. Barclay in the January number as to intelligence in men and animals, depends very much on what we consider to be the precise nature or manner of the reasoning process. As to this point there is a dispute amongst philosophers. One school holds that all deductive reasoning is from general propositions to particular ones, whereas J. S. Mill and his followers maintain that "all inference is from particulars to particulars," and on that account, "the lower animals profit by experience, and avoid what they have found to cause them pain in the same manner, though not always with the same skill, as a human creature. Not only the burnt child, but the burnt dog dreads the fire." As we have no evidence that animals can form general propositions, if we adopt the latter view, then it must be admitted that animals can reason as competently as man can. If, on the other hand, the former doctrine be adopted, then the seeming reasoning of the lower animals can be explained as a simple process of association. "Animals are led, not by a concatenated train of discovered relations, but by mere impulse, i.e., by the suggestion which comes up according to the law of co-existence." Mr. H. C. Rogers asks, "If an animal does precisely the same thing that a man would do under certain circumstances, are we not justified in concluding that animal and man are moved by the same power?" If "power" here means motive, then I do not think we should be justified in forming any such conclusion. Besides, it is impossible for us to know the full and precise "circumstances" under which any animal acts. Again, memory is an act of intellect, but certainly not an act of reasoning in the sense of inferring one proposition from another. As regards the affection of the dog, it is very probable that there is more of selfishness therein than is commonly supposed. That the dog likes his master for the latter's own sake can scarcely be supposed. The fact seems to be, that this animal is possessed of an irrepressible prodigality of life-energy, and any source of the gratification or exercise of that liveliness is of course exceedingly prized by him; and hence when the master dies, the fountain of this life and energy is stopped; "the very source of it is stopped," a circumstance amply sufficient to induce a serious revulsion of feeling, and an unwonted peculiarity of action. With regard to the wonderful feats performed by animals, Dr. Carpenter has, it seems to me, conclusively shown that these are merely mechanical, the result of the animal organism "growing to the way in which it has been habitually exercised." Finally, the view that the reason of man is only developed instinct, has been seriously disputed by men of the highest culture, ability, and sanity. Man

seems to have the faculty of forming certain notions (such as moral good, the fair, the sublime, God, &c.), and a power of anticipating the future, &c., which it would be difficult to prove were ever acquired, or could possibly be acquired by a mere process of development. The average cranial capacity of anthropoid apes and of man, savage or civilized (viz. 10 to 26 or 32), exhibits a proportion which is altogether inexplicable on the supposition that man's brain is a lineal descendant of that of some pre-historic ape, monkey, or baboon.—*P. Q. Keegan, LL.D.*

INTELLIGENCE IN ANIMALS.—Your correspondent, Mr. A. C. Rogers, quotes my words correctly, viz. :—"The great difficulty in the investigation of the minds of animals appears to be that man instinctively and unconsciously, unless checked by reflection, explains their actions, especially in extraordinary cases, by his own modes and laws of thought," but when he asks "will Mr. Barclay kindly inform us how else we are to explain their actions if we are not to use our own modes and laws of thought," he appears to have misunderstood my meaning. Certainly we must use our own laws of thought; most of us do not use them sufficiently. I will illustrate my meaning by considering the questions he puts. Is it simply instinct that induces a dog to starve itself to death on the grave of its master? or risk its life unbidden to save that of a helpless child? In my last letter I defined reason as the power to draw a conclusion from premises. Now, touching as the death of a dog on the grave of its master is, I can see in it no act of reason, but should rather conclude it indicated the absence of the faculty, neither can I perceive any act of reason in a dog leaping into the water unbidden to save a child, which he may do precisely in the same manner as he would jump after a stick which I have also seen a dog do unbidden. A man who could swim and declined to rescue a child from the water would be justly blamed, but who could blame a dog if it remained barking on the bank? It is beyond dispute that animals have some intelligence and memory, but what I question is their power of reasoning, which is the root of man's civilisation and makes him a responsible being. It is a distinct faculty, and unless animals were originally endowed with it, that it should be developed by training as some maintain, appears to me simply incredible, and I have never yet read an anecdote that convinced me they are possessed of it. Since writing my first letter I have seen a book, "Thirty Years among Wild Beasts in India;" the author's remark on the intelligence of elephant and the popular opinions thereon confirm my view of the question.—*H. D. Barclay.*

A CURIOUS CRUSTACEAN.—Some years ago I was passing by a large stagnant pool, when my attention was arrested by a curious creature just beneath the surface of the water, which after some trouble I succeeded in capturing. As I have never read of any fresh-water inhabitant resembling it, I thought some of your correspondents might be able to inform me what it was. As nearly as I can recollect, it closely resembled the common green crab of the seashore, excepting that its "legs" were longer and thinner, and the carapace was circular and serrated at the edges. I brought it home in safety, but whilst I went for the necessary appliances for the examination, it mysteriously disappeared. Subsequently I discovered another and smaller one, which was also lost by an accident before I could study it. The locality where these crustaceans (?) were found, was in the middle of Berkshire, in a large pond close to a wood. The month was July. The creatures were

both apparently basking in the sun at the surface of the water; neither made any effort to escape. They appeared to have no power of swimming nor diving. I hope some of your correspondents may be able to inform me what they were.—*Junior*.

HYDROPHILUS PICEUS.—Can any of the readers of SCIENCE-GOSSIP inform me whether the above-mentioned insect can be reared in captivity; if it can, is there any locality near London where I can look for the beetle or eggs with any chance of success; or can I buy a supply of the eggs of any aquarium dealer? The Rev. J. G. Wood, in his "Fresh and Salt Water Aquarium," gives some information about this beetle, but he neither mentions the time of year when the egg is to be found, nor the food of the larva. On Plate x. he depicts two specimens, one twice the size of the other; are these the different sexes, or extreme variations of size?—*F. Crosbie, Burnet*.

THE DOUBLEDAY COLLECTION.—I was very pleased to see the note in your last number from Mr. James English stating that the above collection is in such good condition, it would however have been of far greater use if published earlier. When Mr. Farn's letter appeared in the "Entomologist," I waited for a month to see if any one would contradict it, but as no one seemed to trouble about it I took the matter up myself—my letter was published in the "Entomologists' Monthly Magazine" for December, and drew from Mr. Farn (the gentleman who had alleged the collection to be in such bad condition) a reply evidently intended to cast ridicule upon myself. I again wrote to the editors of the "Entomologists' Monthly Magazine" with a reply to Mr. Farn, fully refuting all his accusations and remarks, but had my letter returned, with a note from the editors to the effect that as they were then satisfied that the collection was in good condition the correspondence would be stopped. I certainly thought that a short note from the editors to that effect would have appeared in the next number, but this was not done, thus entomologists are left to believe that I am totally disconcerted by Mr. Farn's letter, which is by no means the case. I think under these circumstances I am fully justified in making these remarks to correct so great a misconception with regard to myself. Mr. English's note in last month's SCIENCE-GOSSIP settles the matter in a most satisfactory manner.—*W. J. Vandenberg, Jun., Hornsey, Middlesex*.

GLYCIPIHAGUS PLUMIGER.—In the July number of SCIENCE-GOSSIP, Mr. A. D. Michael announced the capture of a single specimen of this acarus, and after remarking on one in the possession of Mr. George, of Kirton Lindsay, says, "We may, I think, fairly claim this as a British species, although only a single individual has been detected in each instance." I have been fortunate in capturing a large number, male and female, of this interesting mite: and as in the former case, they were found among the fodder in a stable in this city. As there is a considerable quantity of foreign hay used in this place, it is quite probable it may have been introduced; but the fact of its being alive and active, in the middle of December, during a very severe frost, shows that it is hardy enough for our northern climate.—*J. Lambert, Edinburgh*.

YEW IN CHURCHYARDS.—In reply to E. Straker's desire to obtain information respecting the various traditions relative to the planting of the yew in churchyards, &c., the following extracts may not be uninteresting to him, or other readers of "SCIENCE-GOSSIP;" they have been carefully searched out by

a friend living in North Wales, and are well authenticated. The yew (*Taxus baccata*), so celebrated in our own country for its churchyard associations, and for its being employed in the manufacture of bows, the weapon principally used by our warrior ancestors before the introduction of fire-arms, has fewer legends connected with it than might be supposed. The custom of planting yew-trees in churchyards has never been satisfactorily explained. Some have supposed that these trees were placed near the churches, for the purpose of affording branches on Palm Sunday; others, that they might be safe there from cattle, on account of their value for making bows; others, that they were emblematical of silence and death; some, that they were useful for the purpose of affording shade or shelter to those places of worship when in their primitive form. Different writers have entered more philosophically into this question, and presume that the yew was one of those evergreens which, from its shade and shelter, was especially cultivated by the Druids in their sacred groves, and around their sacrificial circles; that when Christianity superseded Druidism, the same places were chosen as the sites of the new worship, and that in this arose the association of the yew-tree with our churches and churchyards. It was also employed in funerals, ("by shroud of white, stuck all with yew;") in some parts of England dead bodies were rubbed over with an infusion of its leaves, to preserve them from putrefaction; and many of our poets allude to its connection with ideas of death. According to Pennant's Scotland, vol. iii., page 25, 4th edition, the yew, by our ancestors, for a classical reason, seems to have been planted among the repositories of the dead; and they had also a political one, for placing them about their houses: in the first instance they were the substitutes of the *Lucia Cupressus*; in the other, they were the designed provision of materials for the sturdy bows of our warlike ancestors. Nature, who speaks to our eye as well as to our ear, paints the yew with gloom; and we see at a glance, the propriety of planting it in churchyards, with respect to poetic sentiments, as well as to its former warlike utility. Tennyson imagines man's last foe, death, as "walking all alone beneath a yew." The "In Memoriam" of Tennyson describes the yew at the "lychgate."

"Old yew, which graspest at the stones
That name the under-lying dead,
Thy fibres net the dreamless head,
Thy roots are wrapt about the bones," &c.

Various other poetical allusions might be mentioned, from Wordsworth and others, in reference to these dismal trees, which are very beautiful, but perhaps others may contribute further remarks on the interesting subject of the yew-tree.—*E. Edwards*.

YEW-TREES IN CHURCHYARDS.—As to the reason why yew-trees are so often found in churchyards. I was walking with a clergyman three or four years ago in a churchyard in Kent, and he pointed out to me the four yew-trees which grew, one at each corner of the sacred inclosure. He told me that the reason why these trees are so often found in old churchyards is that there used to be a law that every parish was to grow yew to be made into bows for the use of the parishioners. As the foliage is very injurious to cattle (cows which have eaten of it frequently die) the yew-trees were planted in the churchyards, in order that there might be no danger of the cattle having access to it.—*C*.

TASMANIAN LAND SHELLS.—Mr. Pettes, in an article on "Sea Goings," gives me credit for having

published a catalogue of Tasmanian Land Shells containing a list of all discovered up to date of publication, 1871. He, however, omits to say that this catalogue, as he terms it, contains over forty descriptions of species nowhere else to be found. In my humble opinion this is something more than a catalogue. I regret that the book has been long out of print, so am unable to send you a copy. Mr. P. is in error when he states that *H. vitrinaformis* was described from a specimen found by him on Mount Wellington. That shell came from a place forty or fifty miles further south, and the type shell is in my possession. It was found by a Mr. Longley.—*W. Legrand.*

THE BIRDS AND THE WEATHER.—We have been diligently feeding the poor little birds here as usual, as in duty bound, during this most trying winter, and a very constant and amusing *clientèle* we have had, furnishing us with a few incidents which may interest your readers. Amongst other provisions for them, we have been in the habit of tying up lumps of fat on a neighbouring bough. At first the tom-tits were left in sole and undisputed possession of this appetising morsel. The robins, however, soon began to cast a longing eye upon it; and, for some time, could not succeed in reaching it, save by a rapid series of hops and flying bites, which must have been very tedious, and anything but satisfying. At last, by astounding perseverance, they mastered the difficulty, and became almost as expert as the tits themselves in perching upon or near their prey and making a meal from it. We did not observe any other birds that arrived so completely at this result; though certain blackbirds and sparrows made many attempts in that direction. On one occasion the lump of fat was disengaged and fell to the ground, but an astute tit managed to restore it to its place, and to impale it upon a thorn, by way of larder. The visitors to our banquet were not altogether confined to bipeds. For a few days a wretched, scrubby-looking half-starved rat made his appearance on the scene, from which we had not the heart to banish him. Blackbirds, thrushes, house and hedge-sparrows, chaffinches, tits in abundance, robins, etc.; one starling and one wagtail were our ordinary company.—*C. W. Bingham, Bingham's Melcombe.*

THE WATER SHREW A DESTROYER OF THE SPAWN OF FISH.—It may not be generally known that the water shrew is a great enemy to the preservers of fish. My cousin, Mr. Masefield, of Ellerton Hall, Salop, annually rears a large number of trout by artificial hatching. For some time it was observed that depredations were committed by some unknown visitor on the troughs containing the spawn; traps were set, and while I was visiting my cousin the culprit was discovered by the capture of *Sorex fodiens*. If this fact has not been observed before, it adds one more to the numerous obstacles which the spawn of fish has to contend against in arriving at maturity in its natural state.—*W. B. Masefield, Tittenson Parsonage, Stoke-upon-Trent.*

HOLES IN OOLITIC ROCKS.—The explanation given by your correspondent H. P. M., in SCIENCE-GOSSIP for January, to F. N. D.'s question, asked in SCIENCE-GOSSIP for November, 1878, "Why holes are found in oolite beneath sand," I think cannot be the correct one, because "water percolating through a superstructure of sand" could not, from the superincumbent mass, move these sand particles about, and if there is no motion there can be no friction, consequently no wearing away. May not these holes have been made by the Lithodomi, or boring molluscs,

previous to, or about the time of, the upheaval of, (or receding of the sea from) the formation in which these holes are found? for it is well known these delicate little creatures have the power of perforating this and similar kinds of rocks.—*J. W., Rotherham.*

FOLK LORE.—Have we a saying in England, similar to the one frequently made use of in Rome, viz.: "St. Catherine's (November 25) weather is Christmas weather." There the peasants look for the same weather on Christmas Day as on November 25.—*C. F.*

INTERESTING PLANTS IN THE ROYAL GARDENS, KEW.—On the shelf devoted to Asiatic plants in the Palm House we notice *Carica papaya*, the Papaw, introduced into this country from India in 1690. Linnaeus supposed it to be a native of Caria, but although now cultivated generally through the tropics, it is considered as originally a native of South America. It has been lately assigned to the natural order Passifloraceæ, tribe Papayaceæ. A diæcious tree with a soft unbranched stem about twenty feet high, slightly swollen at the base, the palmatifid leaves with long petioles being clustered at the summit. The fruit, when ripe, is yellow, and somewhat resembles a melon, it contains an acrid, milky juice, in which Vauquelin found by analysis the albuminoid fibrine, a substance until then believed to be peculiar to the animal kingdom. The whole plant has the remarkable quality of rendering fresh or tough meat tender, by causing a separation of the muscular fibres, and the same effect is said to be produced by merely suspending it among the leaves. At the corner of the central path we find *Strychnos potatorum*, the "clearing nut," which abounds in the forests of India. Natural order Loganiaceæ. It forms a small tree bearing opposite ovate leaves, with two interaxillary spines. The hard wood is applied to a variety of domestic uses. The fruit is black, about the size of a cherry, and contains one seed. The natives of India employ the dried seeds to clarify muddy or impure water, and as they will never drink spring water if they can obtain any from ponds or rivers, the "clearing nut" must be simply invaluable. The inside of the vessel is rubbed round with a seed, for a short time, the water to be cleared is poured in and all its impurities quickly sink to the bottom. Dr. Pereira states that this result is due to the fining action of the albumen and casein, and that many other seeds might be used for the same purpose. On the African shelf is *Tanghinia veneniflua*, the tanghin or ordeal-tree. This is an apocynaceous tree, with alternate elliptical leaves, and long terminal cymes of pale pink flowers. There is a double ovary, but only one usually comes to perfection, forming an ellipsoid fruit about the size of a plum containing a hard stone which incloses the seed. It is this seed which once had so great a reputation among the natives of Madagascar as a detector of guilt; but whatever doubt we might feel concerning its efficacy in that respect, it certainly possesses such extremely virulent qualities that it has been described as "the most poisonous of plants." A kernel no larger than an almond would be, if equally divided, sufficient to destroy twenty persons in less than half an hour. In the year 1830 the Queen of Madagascar determined to rid the country of sorcerers and decided upon a trial by ordeal as the most effectual means of doing so. Great numbers of persons were tried, and it is recorded that while the "unknown plebeians" succumbed to its deadly influence all the "nobility" recovered. Happily such trials are now things of the past. A short distance from the last plant on the

same side is another ordeal-tree, not quite so well known, but included in the same order, *Toxicaphlaa Thunbergi* a native of South Africa. Its leaves are opposite, elliptical, and of a very dark green colour; it is now showing an abundance of small white flowers in axillary clusters. A decoction of the bark is used by the Hottentots as an ordeal.—*Lewis Castle, West Kensington Park.*

METROPOLITAN ASSOCIATION.—At the monthly meeting held on January 28, the following papers were read—"On the Dissection of the Cockroach," by T. J. Briant. The main object of this paper was to show the proper method to be adopted in microscopic dissection, more especially by those who could not afford time for technical investigations.—"On Micro-photography," by C. W. Stidstone. Examples of the author's work were shown upon the screen, some of them being very creditable.—"The Cuticles of Flowers," by Sidney Ireland.—"On Reproduction in the Lesser Celandine," by Henry T. Vivian. The author remarked that in the spring of last year he brought for examination from the neighbourhood of Isleworth a few flowers of this plant; they were placed in water exposed to the light, and he was enabled to observe the very interesting mode in which the young plants of this species were produced. The flowers, to the stalks of which one or two leaves were attached, soon decayed, but singularly enough there were produced what appeared white grains at the axils of the leaves which increased in size as the plant decayed and then fell off and remained at the bottom of the jar. At the end of the year they appeared to be budding and at present had become the tuberous roots of young plants, such as were then exhibited on the table. This circumstance did not appear to be noticed in the botanical works to which the author had access, but he found the process described in a book just published by Shirley Hibbert. It appeared this plant never produced seeds in this climate, though perfectly fitted to do so, as all the organs of fructification were complete. The fact of the plant flowering in the wet weather might perhaps account for the non-production of seed, but it was interesting to note that another form of reproduction took place when it could not be accomplished in the usual mode.—"On the Horse-Bot," by J. W. Gooding, F.R.M.S. This paper was simply a general introduction to the noble series of slides which were exhibited under several microscopes.

BOUGAINVILLEA v. BUGAINVILLEA.—The apparent inconsistency in the orthography of the above word, observed by Mr. John Gibbs, admits of an easy explanation. The latter was adopted by Lindley as the best Latin rendering of the French name. The long *u* nearly represents the sound of the French diphthong *ou*, pronounced *oo*, which does not occur in the Latin language. As regards the first and generally accepted orthography, we find in "Laws of Nomenclature," by M. Alphonse de Candolle, received by the International Botanical Congress, 1867, as "the best guide for nomenclature in the vegetable kingdom," that article 27 states, "when the name of a genus and sub-genus or section is taken from the name of a person the spelling of the syllables is preserved without alteration even with letters or diphthongs now employed in certain languages, but not in Latin." Mr. Gibbs will find some excellent remarks on this subject in *SCIENCE-GOSSIP*, 1877, page 193.—*L. Castle.*

CURIOUS EFFECT WITH THE MICROPHONE.—I do not know whether any one has observed the following curious effect with the microphone. Placing the

receiving telephone on the stand of the microphone, so that the vibrating disk is near the carbon pencil, I find that a slight touch on the microphone produces a continuous musical note, which sounds on till stopped by a rougher touch, or by tapping the table. I used an upright carbon microphone.—*F. R.*

LABURNUM.—In this town there is a laburnum which flowers regularly twice a year, at the usual time and again in the autumn; the flower pendants are shorter, and the flowers closer together than in the ordinary laburnum, a specimen of which grows in the same garden. Would B. H. Nesbit Browne state whether the same peculiarity exists or not in the specimen he has seen?—*W. G. Tuxford.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish *SCIENCE-GOSSIP* a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

R. BEER.—The stories of vipers swallowing their young, are to be found in every work on natural history. In years past, our Notes and Queries columns have chronicled many such.

J. W. T.—Your papers will certainly appear on the first opportunity. We should be glad to accept that you now refer to.

K. E. GAMP.—"Blue John" is a fluato of lime, not manganese. Oxide of manganese is the violet colouring matter of it. The mineral is very soft, and can be easily polished after cutting and rubbing down. The method of polishing fossil wood depends on how the latter is mineralised. If silicified, it is first cut and ground down, and then polished with emery, the finest kind being used last.

C. R. S.—We cannot tell you how to get an assistant-curatorship in a colonial or other museum, except by advertising for such a situation.

B. C. J. (Leeds).—See the Rev. J. C. Crombie's article on lichens, in "Collecting and Preserving Natural History Objects," price 3s. 6d. Hardwicke & Bogue, 192 Piccadilly, London, W.

R. RATCLIFFE.—The brown objects found underneath the beetle are the beetle-mite (*Gamasus coleopterorum*).

MICRO.—The anchor-shaped spicules mounted on slides are undoubtedly those of sponges. The coloured spicules appear to belong to some Aleyonidium. Please send us one or two other slides when you mount them, that we may investigate them further.

J. A. SANFORD (Toledo, Ohio, U.S.)—Wishes botanists who are desirous of exchanging rare British for American plants, to communicate with him as per above address.

H. J. LIVETT.—The grubs which attacked your celery were evidently the larvæ of some beetle, but they reached us in such a dried-up and shrivelled condition, that it was quite impossible to make out the species. Watering growing celery with chamber lye is a capital stimulant to the plant, and an equally bad one for grubs of all kinds.

W. E. M.—The article on "Collecting and Preserving" is the best one we know of on the subject of cleaning and preparing bones. There is a great dearth of information on the subject, and we should be glad if some of our readers who have worked at it would contribute a good practical paper on the subject.

J. C. RAYE.—The articles on "Our Common British Fossils, and where to find them," will be resumed in our May number, and continued. Press of literary work has delayed their issue.

DR. M.—The objects on the piece of sea-weed were a colony of polyzoa, called *Membranipora membranacea*.

C. W. L.—The New Cross Microscopical and Natural History Society, meets at the New Public Hall, Lewisham High Road.

R. HUMPHREY.—Our correspondence is too extensive to permit us acknowledging by letter the receipt and acceptance of every MS. sent. If accepted, we insert it in the order of its date, as far as we possibly can. No apology is needed on your part.

J. E. M.—Wishes to know if "Heywood's Register of Facts and Occurrences relating to Literature, Science and Art" is still in existence. Perhaps some of our correspondents can answer him.

H. SISSONS.—We are obliged, in the general interests of other

"exchangers," whose advertisements are crushed out, not to allow an "exchange" to exceed three lines, unless it is paid for as an advertisement. Yours would make eight lines.

B.—A good specimen of *Euplectella* might be purchased at any natural history dealer's in London, say Henson's in the Strand; T. D. Russell, or Bryce Wright, for about 7s. 6d. or 10s. (2) As to preserving crustaceans, see note on this subject by a capital authority, Mr. T. D. Russell, in September number of SCIENCE-GOSSIP for 1877. (3) There is no book or even exhaustive article on the latter subject. One is much needed.

GREGORIUS.—The occurrence of starlings in flocks, especially in the southern counties, is very common during hard winters. Many of them leave the northern parts of Britain. The starling has a sweet, twittering kind of note, but we should hardly rank it among our song-birds.

W. BENNET.—Bat received. Will examine it and let you know.

J. E. STEPHENS.—The object is part of the cluster of eggs laid by the common whelk (*Buccinum undatum*). See "Half Hours by the Sea-side," by J. E. Taylor (page 223), published by Hardwicke & Bogue, price 4s.

H. G. WHEELER.—We believe the diatom you found in the museum is undescribed. It is a *Cocconeis*, and might be called *Cocconeis umbonata*, or *Cocconeis crucifera*.—K.

EXCHANGES.

WANTED to exchange lichens for some desiderata in Parneliae, Ramalinae, Stictiae, &c.—J. McAndrew, New Galloway, N.B.

RISSOA LACTEA, *Homaligeria rota*, and other rare British shells, offered for minerals. Lists exchanged.—E. Duprey, Jersey.

WANTED, in exchange for good typical specimens of Cornish rocks, and some minerals, a good collection of fossils representing the new red sandstone, or the permian or the old red formations.—S. Tressider, Jun., Marlborough Road, Falmouth.

I HAVE a quantity of shells, mostly small, from east and west coasts of Africa, which I should be glad to exchange for micro slides or good material.—G. W. Brady, Carrow Works, Norwich.

DUPLICATES of forty species of British marine shells for others or birds' eggs.—Thomas H. Hedworth, Dunston, Gateshead.

WANTED, named algae, zoophytes, &c., exchange.—3 Belmont Villas, New Brompton, Kent.

FOR a fine spray of *Plumularia falcata* or *Sertularia abietina*, each loaded with *Crisa eburnea*, and *Cellepora pumicosa*, send well-mounted slides to E. W. Burgess, 35 Langham Street, London. Pollens and rock sections preferred.

WANTED, tooth of labyrinthodon, for microscopical purposes; will give interesting slide or material in exchange. W. H. Harris, 44 Partridge Road, Cardiff.

WANTED, a copy of the last edition of the "Micrographic Dictionary": anyone having one for disposal, at a reasonable price, will oblige by addressing H. G. Wheeler, 24 Knowsley Street, Bury.

GOOD British shells given in exchange for the shell stoppers of foreign shells (Operculums) of various sorts. Also slabs of polish of madrepores for good Silurian fossils. Will also exchange thin down specimens of corals for the microscope for good foreign Pinnae, Mediterranean sorts preferred.—A. J. R. Sclater, 4 Bank Street, Teignmouth, Devon.

"CONCHOLOGY," by W. Wood, vol. I, 59 hand-coloured plates, in good condition. Wanted, Nicholson's "Palaeontology," or others.—J. Carpenter, Cheshunt, Herts.

WANTED, a few amateurs to join an ever-circulator, devoted to botany, which has been in circulation since 1877. For further particulars, address "Conductor," 233 Upper Brook Street, Chorlton-on-Medlock, Manchester.

WANTED, "L. C." 7th edition, Nos. 5, 13b, 18c and d, 23, 25, 32, 37, 65, 90, 103, 106, 148, 153 (?), 214, 215, 221, 309, 367b, 395, for others. Send lists. Also 100 named mosses, offered for same number from another locality, or for an equivalent.—R. V. Tellam, Bore Street, Bodmin.

"L. C." 7th edition, Nos. 41, 45, 107, 124, 172, 209, 366, 667, 814, 822, 824, 831, 858, 875, 906, 932, 1040, 1135, 1264, 1271, 1401, 1447. Send lists to H. R. Moiser, F.G.S., 2 South View, Haworth, near York.

WANTED, objects of marine zoology. Agates, minerals, &c. offered in exchange.—J. P. Wright, Sunnyside Terrace, Undercliffe Lane, Bradford, Yorkshire.

WANTED, a good second-hand microscope: write, stating full particulars, to C. McIntosh, 110 Dalling Road, Hammer-smith, W.

WELL-MOUNTED slides of portions of pigeon post, used during siege of Paris, in exchange for two slides of interest, also well-mounted.—L. Hawkins, Hillside, Hastings.

THREE skulls, lemur, porcupine, and another, also a good scorpion, and a small flying-fish, to exchange for British birds' eggs, side-blown, named fossils, or others in natural history objects. SCIENCE-GOSSIP for 1877, wanted, unbound preferred.—W. B. R., 165 White Ladies Road, Bristol.

AUTHENTICATED, side-blown eggs, 300 species, including European, British, and African, clutches, broad-billed sandpipers, parrot crossbills, hawk, owl, red-foot falcons, and most of the

birds of prey, collected 1878; exchange arranged by letter.—Sissons, Sharrow, Sheffield.

WANTED, living specimens of Doris, Trochus, Nassa, &c. in exchange for good microslides, all well-mounted.—Apply Henry Insley, 1 Back of Chester Place, Gerrard Street, Birmingham.

To exchange, sixteen three-shilling parts of "British Wild Flowers," by J. E. Sowerby, for Cox's "British Coleoptera" and natural history specimens; also, British plants for fossils.—G. Robson, 92 Cranbourne Street, Leicester.

DUPLICATES, pairs of fine well-set local Lepidoptera from cabinet. Desiderata, skins of birds, squirrels, &c.

"NATURE" for 1876 (four numbers missing), offered for foreign or British Algae.—E. C. J., Monson Nursery, Red Hill, Surrey.

ONE HUNDRED silkworms' eggs (*Bombyx Yama Mori*), on receipt of stamped envelope or object of interest.—Mrs. Skilton, London Road, Brentford, Middlesex.

CASSELL'S "Wild Flowers," 24 numbers; "European Butterflies and Moths," 12 numbers; a West Indian centipede and two lizards in spirits. Will exchange all or any of these for "Popular Science Review," geological works, or fossils.—J. A. Floyd, Mission House, Alcester, Warwickshire.

SLIDE of *Glycyphagus plumiger*, in exchange for other acarus (rare) or animal parasite.—J. Lambert, 12 Glen Street, Edinburgh.

FORAMINIFEROUS SAND from Barmouth, very rich, containing many rare forms, in exchange for slides, material, or shells.—J. J. Colton, Barmouth.

DUPLICATES of British land and fresh-water shells offered, and the localities of each recorded. *Succinea oblonga*, *Lim. Burnettii*, *Lim. involuta*, *V. pusilla*, *T. antvertigo*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, *Pupa ringens*. Desiderata, named foreign land and marine shells, which, if not in stock of any collector, are readily obtainable from dealers.—W. Sutton, High Claremont, Newcastle-on-Tyne.

WANTED, to borrow for a short time a flora of South Devon. Address, with terms, A. D. Melvin, North Malvern.

FOR well-mounted flea from mole, hedgehog, rabbit or hare, also cattle tick, send good slides, marine diatoms, diatomaceous earth, or good micro-fungi particularly wanted.—George Turvill, East Worlham, Alton, Hants.

WELL-ROOTED plants of exotic ferns, blooming, greenhouse plants (not bed ng) and many species of the Cacti tribe, several producing magnificent flowers, in exchange for rare British shells, foreign shells, polished stones, books on natural history, or others.—E. R. F., 82 Abbey Street, Faversham.

CRYSTALS of Zeolite from the Giant's Causeway, good polariscopic object; also Foraminifera from Antrim and Down beach floatings, and diatomaceous earth from Toome bridge, for any good slides. Lists exchanged.—William Gray, Mount Charles, Belfast.

BOOKS, ETC. RECEIVED.

"Notes by a Naturalist on the 'Challenger.'" By H. N. Moseley, F.R.S. London: Macmillan & Co.

"The Study of Rocks." By F. Rutley, F.G.S. London: Longman & Co.

"Practical Geology." By W. J. Harrison, F.G.S. London: W. Stewart & Co.

"Geological and Geographical Survey of Colorado, &c.," 1878. Washington: Government Printing Office.

"Birds of the Colorado Valley." By Dr. Coues: Washington: Government Printing Office.

"Journal of the Royal Microscopical Society." February.

"American Quarterly Microscopical Journal." January.

"Journal de Micrographie." January.

"Feuilles des Jeunes Naturalistes." February.

"Les Mondes." February.

"Revue Mycologique." January.

"Midland Naturalist." February.

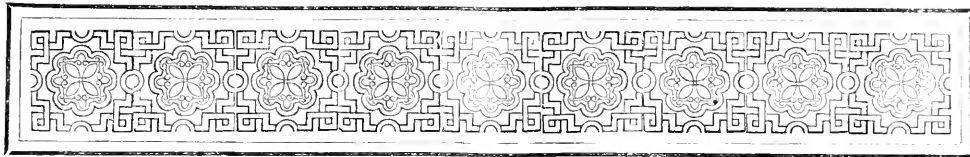
"Land and Water." February.

"Brierley's Journal." February.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—

F. K.—T. S.—C. P. O.—J. McG.—E. D.—W. B.—W. H. D.—J. C.—W. S.—T. F.—F. T. F.—T. W.—W. L. B.—H. B.—E. E.—G. W. B.—W. E. M.—C. W. B.—A. J. R. S.—W. L. G.—F. M.—C. R. S.—H. G. W.—J. C.—H. D. B.—W. L. D.—E. W. B.—I. C. T.—Dr. M.—T. H. H.—J. A. S.—D. M. D.—G. L. B.—H. P. M.—H. W. L.—W. H. H.—R. R.—J. O.—Dr. P. Q.—M. M. B.—J. E. M.—R. S.—G. R.—R. E.—J. W. S.—J. C.—R. H. I.—J. S.—W. J. H.—A. B.—F. C.—W. B. R.—J. S.—E. M.—Dr. De C.—R. H.—A. D. M.—C. McL.—J. P. W.—J. W. C.—R. V. T.—R. B.—T. F. U.—A. C. C.—W. J. V.—H. R. M.—F. I. W.—L. C.—J. T.—G. N.—J. R.—V. W. M.—B. E. S.—C. F.—W. B. M.—J. U.—W. S.—J. J.—J. W. T.—H. E. G.—J. L.—J. A. F.—H. S.—Professor T.—J. F. T.—D. S. C.—H. W.—W. G.—R. G.—M. S.—E. C. J.—W. H. H.—W. S.—E. R. F.—G. T.—R. P. P.—C. R. L.—A. D. M.—W. B.—G. C. D.—W. G.—W. E. B.—J. E. S.—&c.



A GOSSIP ABOUT NEW BOOKS.



I have not been so much delighted with a book since we read Darwin's "Journal of a Naturalist," as we have with Mr. H. N. Moseley's *Notes by a Naturalist on the "Challenger."* (London: Macmillan & Co.) Singularly enough, the book is dedicated to Darwin, in acknowledgement of that author's "Journal." We cannot forbear quoting the

"Dedication," for although these literary vagaries are "survivals" of a period, when they were unfortunately necessary to a poor author, yet they afford modern writers the opportunity of expressing their genuine gratitude for services other than pecuniary they have received. Mr. Moseley's dedication is moreover representative, for it expresses the feelings of many grateful naturalists who have not the opportunity of so practically acknowledging it as Mr. Moseley has. "To Charles Darwin, Esq., LL.D., F.R.S., &c. From the study of whose 'Journal of Researches,' I mainly derived my desire to travel round the world; to the development of whose theory I owe the principal pleasures and interests of my life, and who has personally given me much kindly encouragement in the prosecution of my studies, this book is, by permission, gratefully dedicated."

Mr. Moseley has long been regarded as one of our most promising young naturalists. He inherits the scientific tendencies of his father, the distinguished and lately deceased Rev. Canon Moseley. As a Fellow of Exeter College, and the possessor of the Radcliffe travelling fellowship, he has been fortunately enabled to pursue studies for which he is so well fitted. His

researches in the natural history relations of the Milleporidæ and Stylasteridæ, in which he has shown that these abundant and so-called "Corals" are in reality allied to the *Hydroid polypes*, rather than to the Anthozoa, have opened out a new field of speculation and classification. Although the "Challenger" expedition has already furnished us with abundant literature, it is not invidious, but simply a justice to the talented author of this book to say that none will be so warmly or satisfactorily welcomed and read. In a pleasant confidential manner, Mr. Moseley makes his readers the companions of his voyage. We gradually feel as he does the necessity to examine every object, mineral, vegetable, or animal, and we are delighted by finding these objects assuming a new importance, when regarded in the light of Evolutionism. For the author is an ardent evolutionist, and makes frequent use of that philosophy to speculate on derivations, relationships, and general embryology. We can but faintly indicate the fresh and delightfully new avenues of thought which Mr. Moseley's book opens out. Nothing is neglected—physics, physical geography, geology, mineralogy, botany, zoology, anthropology; in each of these departments the reader will find abundant reflections. The "Challenger" expedition has not been so successful in results as its friends desired it, and all confess to a disappointment. We cannot but think, however, that Mr. Moseley's "Notes" will do more than anything which has yet publicly appeared to restore confidence in the scientific results of the celebrated voyage.

Flowers and their unbidden Guests, by Dr. A. Kerner; translated by Dr. W. Ogle (London: C. Kegan Paul & Co.), is a well-known work, recently translated from the German. We are glad that English readers have now the opportunity of studying one of the most delightful books that have yet appeared on the mechanism and morphology of flowers. It is a veritable romance of natural history; it throws a new and poetic glamour about the simplest flower of the roadside. We have already learned how flowers have been coloured and perfumed and differently shaped, in order to attract useful insects to the necessary work of cross-fertilisation, but here we are introduced to numberless devices, by means of

which flowers (like conscious agents) are enabled to repel and refuse admission to insects, such as ants, which would rob the nectaries whilst rendering no useful services in return. The hairs and glands on stems and calyx, the fibrils on petals like those of the bog-bean (*Menyanthes trifoliata*), &c., are all intended against "forbidden guests." No one could have been better intrusted with the editing of an English edition of this remarkably original work than Dr. Ogle. It is illustrated by lithographed details of flowers whose structures are intended to repel insect pests, and we have thus rather too closely packed together no fewer than one hundred and eighteen figures.

The Physical Geology and Geography of Great Britain, by Professor Ramsay (London: Edward Stanford), is a good illustrative book of the doctrine of evolution, and "The Survival of the Fittest." This is the fifth edition, and it has gradually grown to its present remarkable bulk from a thin revised copy of "reporter's notes" of certain lectures on the subject. It has now attained the dignity of a book, after additions to each edition of new matter and fresh illustrations; and it warrants us in saying that it is the best and most readable book on the subject in the English language. When a work has reached its fifth edition, it has proved its amenity to ordinary criticism. But the numerous additions to, and the general revision of the present work have virtually made it a new book. We have read it through from back to back with fresh pleasure, although we had experienced much delight with the perusal of the more meagre third edition. We take it as a good sign when men of Professor Ramsay's position, as head of the geological survey, and also examiner-in-chief in geology at South Kensington, write books of this broad and understandable character for geological readers. We hardly need say, after the above remarks, that we cordially and earnestly recommend the work to all students.

Wild Sports and Natural History of the Highlands, by Charles St. John. (London: John Murray.) This is a new and illustrated edition of a work which sportsmen - naturalists have long placed on their shelves, side by side with Gilbert White's "Selborne." We are thankful that the publisher has issued such an attractive edition as is likely to make this most enjoyable book known to readers, who perhaps are not aware of the treat in store for them on perusing it. It is one of the "classics" of our zoological works, full of mountain air, out-door adventures, and observations, and in full sympathy with life of all kinds. This edition is *de luxe*. Apart from the excellency of the clear type, the woodcut illustrations are gems of art, for among the artists are Harrison Weir, Charles Whympers, A. C. Corbould, A. H. Collins, A. T. Elwes, and J. W. Whympers. The reperusal of this most delightful book, under these advantageous circumstances, has been as refreshingly interesting as lovers' quarrels.

Six Months in Ascension, by Mrs. Gill (London: John Murray), gives a popular and very readable description of the islands of that name, and of the expedition thither to determine the correct distance of the earth to the sun. There is a capital preface by the husband of the authoress, Mr. David Gill, giving the history of solar measurements. Some people have complained that astronomers should differ to the extent of a million or two of miles as to the correct distance of the sun from us, but Mr. Gill well puts this, when he tells us that if any one desires to form an adequate idea of the difficulties of measuring the sun's distance to a million of miles, he can best do it by trying to measure the thickness of a florin-piece looked at, edge on, a mile off. We may regard Mrs. Gill's book as the best account of the history of, and the reason for, the recent Venus' Transit Expedition yet published.

Geological students and others ought to be thankful that the best man in England for such a task has been selected to write an elementary text-book of Petrology, a subject too little studied by English mineralogists. *The Study of Rocks*, by Frank Rutley, F.G.S. (London: Longmans, Green, & Co.), is the name of this new and cheap little manual. It supplies a great want; one attempted very successfully in Mr. G. H. Kinahan's "Handy Book of Rock Names," but still not properly met before. Petrology has been gaining ground in England, and this text-book comes in the very nick of time. In it the student will find full instructions as to how to collect and arrange rock specimens, and to cut and prepare sections for microscopical examination.

Practical Geology, by W. Jerome Harrison, F.G.S. (London: W. Stewart & Co.), is a cheap little manual, admirably adapted to teacher's classes, and to young and earnest students. The author is a well-known geologist, who has had sufficient experience in geological teaching to know exactly what a student wants, and how those wants are to be supplied. This little book deals a good deal with field geology, and thus enables the reader to sally forth and intelligibly understand what he sees. Once a lad has done this, he is a geologist henceforth. There are few of the numerous elementary text-books of geology, that we can commend more than this of Mr. Harrison's.

Baths and Bathing, and *Personal Appearance in Health and Disease* (London: Hardwicke & Bogue), are two additional little volumes of the now well-known "Health Primers." No family library ought to be without these cheap, attractive, and well-printed little volumes. Each is an authority on the subject it treats upon, for the authors are among the most eminent. We cannot wonder, therefore, at the great success of this speculation. The price of each "Primer" is only one shilling, and as they deal with almost every subject affecting health and disease, and are written in a plain and intelligible manner, there

is no longer any excuse for being ignorant of what ought most to concern us.

The volumes issued by the United States Geological Survey, under Dr. Hayden, indicate as great industry as their subject-matter does diligence in the field. The *Tenth Annual Report* is just to hand, in a bulky volume, well stored with maps, sections, and other illustrations, of the geological and geographical survey of Colorado and the adjacent territories. It is in reality a report of the progress made by the survey in the year 1876. In it we have laborious details of the various strata and their physical condition, as well as interesting generalisations. Among the geologists who contribute to the "Reports," are Dr. C. A. White, Professor Endlich, Dr. A. C. Peale, W. H. Holme, A. D. Wilson, H. Gaunett, Professor Lesquereux, A. S. Packard, Dr. Hoffmann, and others. The archaeology of the area surveyed is detailed, as well as the geography, geology, botany, zoology, &c. *The Birds of the Colorado Valley*, by Dr. Elliot Coues, is another bulky volume of this survey series, detailing the scientific and popular information concerning North American ornithology, by the naturalist best fitted for the task. Will the English government ever learn to be less niggardly and mean with the works published by the members of our own geological survey? At present, by the high price demanded for the volumes, and the stint with which they are issued to scientific journals for review, they appear to be doing their best to withhold the scientific information from that public who have already been taxed to pay for it.

ANOTHER FUNGUS RAMBLE IN EPPING FOREST.

By DR. DE CRESPIGNY, Author of "A New London Flora," &c.

[Continued from page 6.]

WE find no fungus in our collection referable to the family of Hydnei: some of the stemless and resupinate forms are common enough on dead wood and fallen branches, but *Hydnum repandum*, an edible species with the habit of an agaric, has to the best of our knowledge not been reported as occurring in Epping forest; but, as we gathered a specimen in Highgate wood a year or two ago, it may not improbably be met with also in the forest; it will be recognised by the close-set series of spinous processes over which the hymenium is spread out. The pileus, usually irregular (as in the figure), is of a pale ochre colour.

Of fungi belonging to the Auricularini we have *Stereum hirsutum* and *purpureum*, a *Corticium*, and *Thelephora lacinata*. In this family there are neither plates, tubes nor spinous processes: the hymenium is spread over the smooth surface of the hymenophorum, with which it is confluent. These

fungi are waxy or gelatinous or mostly coriaceous expansions growing upon decayed wood or attached to dead sticks, stems, &c., many of them resupinate. *Stereum hirsutum* is very common and very variable; when young the hymenium is of a tawny yellow colour; the pileus coriaceous, reflexed, strigoso-hirsute. *S. purpureum* when fresh, has the hymenium of a pale violet hue; (on stumps of felled trees). All the many recorded species of *Stereum*, *Corticium* and the like, resemble each other; they differ merely in colour and substance, and are consequently difficult to distinguish.

Thelephora lacinata is a very singular-looking fungus; it grows upon sticks, heath stalks, and at the roots of old trees; also on leaves (or their stalks); it is of a madder brown colour, with a lighter shaded or greyish border when fresh gathered: a fibroso-squamose flat or foliaceous expansion without any cuticle, the fibres projecting beyond the margin and imparting that laciniated appearance to the plant to which it owes its name; the hymenium is inferior flocculose and papillose: the spores, as we observed them, were quaternate on sporophores.

Of the club-shaped fungi, *Clavariæ*, are specimens of three species: *C. cristata*, *C. vermiculata*, and *C. fusiformis*; the former in damp shady parts of the forest; the second on a grassy common at Woodford; the last mentioned in open parts of the forest behind Loughton,—it has fasciated or subfasciated clavi of a yellow colour, and resembles *C. fastigiata* or *C. inæqualis*; maybe we have mistaken it for the latter species. In this family the hymenium is scarcely distinct from the hymenophorum, and covers the whole surface of the plant from the base to the apex.

In the second order of the spore-bearing fungi, the Gasteromycetes, the hymenium consisting of closely packed cells, is rolled up, in some cases, as it were into a sac or ball called peridium, and not until the rupture of this by decay or otherwise, are the cells exposed and the spores liberated. Of the Trichogastres, which contain the typical forms of the family, we have examples in three kinds of puffballs: *Lycoperdon gemmatum*, *Scleroderma cepa* and *S. verrucosum*. The peridium of the former genus is membranous; that of the latter is hard and coriaceous: both genera occasionally exhibit a warty character in the integuments, *L. gemmatum* especially so (see fig. 68). "The hymenium occupies the surface of innumerable sinuses, folds and cavities, all closely compacted into a crumblike mass, the stem being a continuation of the barren cells" (Berkeley). In *Scleroderma* the hymenium is traversed by veins, and the spores are larger than they are in *Lycoperdon*.

In the Phalloidæ family, the hymenium is also confined at first in a peridium which differs from that of the preceding family in that there is an intermediate gelatinous layer between its coats. The stipe in its undeveloped condition has the large cells or cavities of its parenchyma compressed; but they are obvious

enough when bursting through the volva : it attains a growth of from four to six inches. The hymenium is deliquescent when mature :—*Phallus impudicus* ; frequent, and when not visible to the eye, sensible, by the sickening odour which it diffuses, to the smell.

On a hedge bank at Chingsford Hatch, near Woodford, some years ago, we gathered specimens of a

curious plant belonging to another family of the Gasteromycetes, viz., *Nidularia striata* (may be there now) ; the peridium, or rather the receptacle, in this tribe is open and cyathiform when fully developed, and the spores though produced on sporophores, are compacted into little globose bodies, of which there are several in each receptacle, and each of them

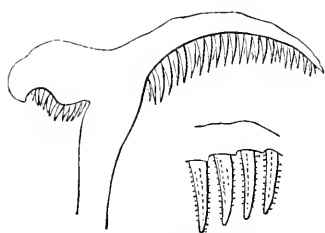


Fig. 62.—*Hydnum repandum* ; a. spines magnified.

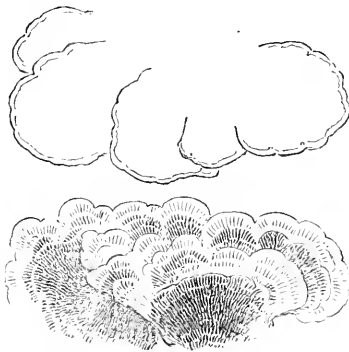


Fig. 63.—Smooth hymenium and strigoso-hirsute pileus of *Stereum hirsutum*.



Fig. 64.—Papillose hymenium and spores of the same, quaternate on sporophores.

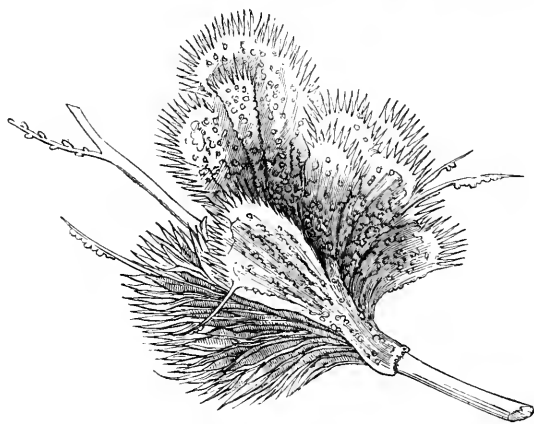


Fig. 65.—*Thelephora laciniata* (upper and under surfaces).

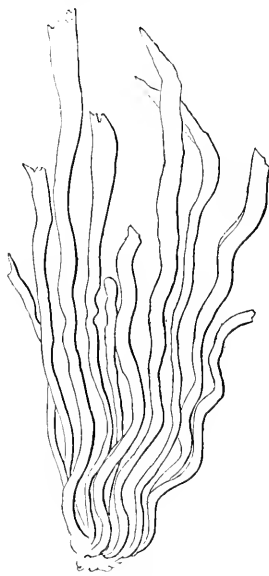


Fig. 66.—*Clavaria fusiformis*.

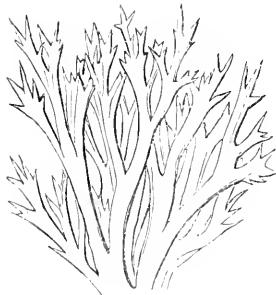


Fig. 67.—*Clavaria cristata*.

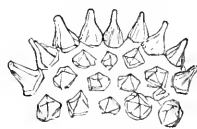


Fig. 68.—Spinulose warts on the cuticle of *Lycoperdon gemmatum* (enlarged).

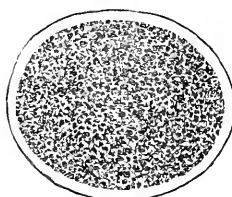


Fig. 69.—Section of a *Sclerotinia*, showing the central purplish-black mass of cells.

attached by a filament to its base. These plants are gregarious ; something of similar growth may be observed on the fronds of certain species of Marchantia.

Of the Ascomycetous order, also, we found a few interesting fungi, viz., *Xylaria hypoxylon*, from the base of an old gate-post ; *Peziza vesicularis*, from a dunghill ; and a *Sphæria* or two from the dead branches of trees. The fructification in plants of this order consists of sporidia (compound spores) enclosed in cases called asci, either free or immersed in the substance (stroma) of the fungus.*

Peziza vesicularis is common : the matrix is rotten hay or straw haulms. The sporidia are eight in number, and, closely packed with the

* Similar to what obtains in lichens, except that no shields are developed for the purpose.

asci, which contains them, are barren or empty asci, called paraphyses.* The cups are of a brownish colour, not unlike very thin gutta percha, brittle, the hymenium soft and velvety from the compact layer of asci with which it is covered. *Xylaria hypoxylon* has the habit of *Clavaria*; it is black, greyish at the summit, hairy below. The horny receptacles in which the asci are contained are called perithecia.

Sphæria is something of a lichen in its habit of growth. The genus has been of late years split into several sub-genera: the distinctions are difficult to

Sapedonium, yellow boletus mould as it is called; an agency by which one fungus is converted into a mass of spores produced by another; frequent: and *Tuberularia* (fam. Stilbacei), little excrescences on dead wood; they are composed of compacted threads; also frequent. In conclusion we would refer those of our readers who may be interested in microscopic mycology to the splendid work of the brothers Tulasne on the subject, in which the growth of the reproductive agency from the tissue, and various forms it assumes are most admirably figured and described, while

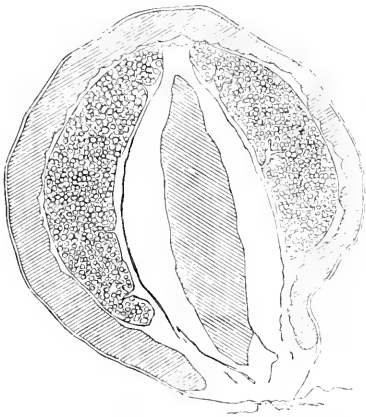


Fig. 70.—Vertical section of *Phallus impudicus*, in the young state, showing the hymenium, gelatinous intermediate layer, and undeveloped stipe.

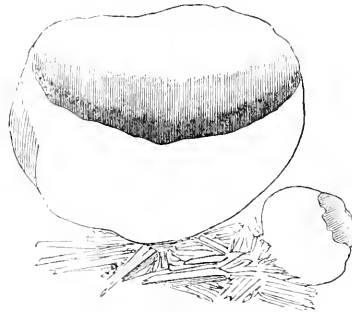


Fig. 71.—*Peziza vesicularis*.

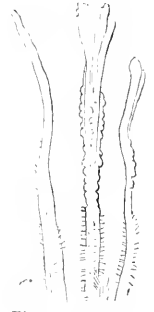


Fig. 72.—*Xylaria hypoxylon*.

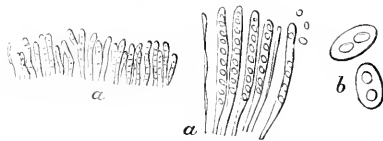


Fig. 73.—Asci of *Peziza vesicularis*; b, sporidia: all magnified.

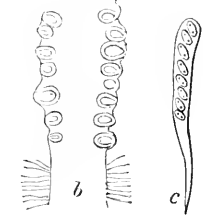


Fig. 74.—*Xylaria hypoxylon*; b vertical section showing the perithecia; c an ascus of the same containing sporidia.

make out; we refrain therefore from naming our specimens, and confine ourselves to remarking that they are black excrescences usually found on the bark of dead branches of trees, with carbonaceous perithecia, pierced at the apex and mostly papillate. The higher forms of these Ascomycetous fungi are represented by the truffle and morel. The types of other families belonging to the order are *Hypoxylon* and *Phacidium*. Specimens of *Phacidium* we found upon the leaves of a sycamore tree at Woodford. We would also observe that the "perithecia" of the Ascomycetes proper must not be confounded with the "sporangia" of a section of moulds which comprise the family of the Physcomycetes associated with them. These growths are forms which should occupy a position intermediate with the Hymenomycetes: the contents of these "sporangia" are simple spores, not sporidia. Of the rust, smut, mildew, mould (not physcomycetous) and other microscopic growths found upon vegetable matter of different kinds which compose the Coniomycetous and Hyphomycetous orders, we have also two curious growths belonging to the latter, viz.,

Epping Forest, well explored, will afford abundant material for study.

P.S.—At page 234, No. 167, *erratum*. *Pleurotus*: add, "Stem, when present, lateral or excentric."

NOTE.—*Pholiota aureus*: said not to be the true species known by this name and very rare, but an allied form, *P. spectabilis*.

(Concluded.)

LIMESTONE AS AN INDEX OF GEOLOGICAL TIME.

THIS is the title of a paper recently read before the Royal Society, by Mr. T. Mellard Reade, C.E., F.G.S. The author showed that the geological history of the globe is written only in its sedimentary strata, but if we trace its history backwards, unless we assume absolute uniformity, we arrive at a time when the first sediments resulted from the degradation of the original crust of the globe. There is no known rock to which a geologist

* Besides these, simple cells, called gonidia, attached to simple filaments, have been observed in these as in most kinds of fungi.

could point and say "that is the material from which all sedimentary rocks have been derived," but analogy leads us to suppose that if the earth had an igneous origin, the original materials upon which the elements first began to work were of the nature of granite or basalt. From a variety of considerations drawn from borings, mines, faults, natural gorges and proved thicknesses of the strata of certain mountain chains, the author arrives at the conclusion that the sedimentary crust of the earth is at least of an average actual thickness of one mile, and infers from the proportionate amount of carbonates and sulphates of lime to materials in suspension in various river waters flowing from a variety of formations, that one-tenth of the thickness of this crust is calcareous. Limestone rocks have been, geology tells us, in process of formation from the earliest known ages, but the extensive series of analyses of water made by Dr. Frankland for the Rivers Pollution Commission, shows that the later strata in Great Britain are much more calcareous than the earlier. The same holds true of the continent of Europe, and the balance of evidence seems in favour of the supposition that there has been on the whole a gradual progressive increase or evolution of lime. The "Challenger" soundings show that carbonate of lime in the form of tests of organisms is a general deposit characterising the greater part of the ocean bottoms, while the materials in suspension are, excepting in the case of transport by ice, deposited within a distance of 200 miles of land. This wider distribution in *space* of lime, the author thinks, must also profoundly influence its distribution in *time*, and he shows this by example and illustration. It can also be proved to demonstration that the greater part of the ocean bottom must at one time or another have been land, else the rocks of the continents would have become gradually less, instead of more, calcareous. Thus the arguments drawn from the geographical distribution of animals are reinforced by physical considerations. The author goes on to show that the area of granite and volcanic rocks in Europe and the part of Asia between the Caspian and the Black Sea, as shown in Murchison's map of Europe, is two-twenty-fifths ($\frac{2}{25}$) of the whole; much of this is probably remelted sediments and some of the granites the product of metamorphism. From considerations stated at length it is estimated that the area of exposures of igneous to sedimentary rocks would be for all geological time liberally averaged at one-tenth ($\frac{1}{10}$) of the whole. These igneous rocks are either the original materials of the globe protruded upwards, or they are melted sediments, or a mixture of the two. The only igneous rocks we know of are of the nature of granites and traps. If these rocks do not constitute the substratum of the earth, and all known rocks, igneous as well as sedimentary, are derivative, either geological time is infinite, or the rock from which they are derived is, so far as we know, annihilated geologically speaking, and we have no re-

cords of it left. If we assume the latter as true, the past is immeasurable, but in order to arrive at a minimum age of the earth, the author starts from the hypothesis that the fundamental rocks were granitic and trappean. From eighteen analyses by Dr. Frankland, it is shown that the water flowing from granitic and igneous rock districts in Great Britain contains on an average 373 parts per 100,000 of sulphates and carbonates of lime. The amount of water that runs off the ground is given for several of the great continental river basins in Europe, Asia, Africa, and America. The annual depth of rain running off the granitic and igneous rock areas, taking into consideration the greater height at which they usually lie and the possibility of greater rainfall in earlier ages, is averaged at twenty-eight inches, and the annual contribution of lime in solution in the forms of carbonates and sulphates at seventy tons per square mile. With these elements, and giving due weight to certain physical considerations that have been urged in limitation of the earth's age, the author proceeds to his calculations, arriving at this result, that the elimination of the calcareous matter contained in the sedimentary crust of the earth must have occupied at least 600 millions of years. The actual time occupied in the formation of the groups of strata as divided into relative ages by Professor Ramsay, is inferred as follows:—

	Millions of years.
Laurentian, Cambrian, and Silurian . . .	200
Old Red, Carboniferous, Permian, and New Red . . .	200
Jurassic, Wealden, Cretaceous, Eocene, Miocene, Pliocene, and Post-pliocene . . .	200
	600

The concluding part of the paper consists of answers to objections. The author contends that the facts adduced prove geological time to be enormously in excess of the limits urged by some physicists, and ample to allow on the hypothesis of evolution for all the changes which have taken place in the organic world.

ON ALTERNATION OF GENERATIONS.

THIS term—used in botanical works to express a consecutive series of phases exhibited in a marked manner by most flowerless plants before reaching maturity—is a very unfortunate one, implying that each form in the series is an individual, which is erroneous. The following description of the successive stages in the growth of a fern shows what the term "alternation of generations" is intended to convey. The spore, under favourable conditions, gives origin to a minute green leaf-like body called a *prothallium* or *proembryo*, bearing antheridia and archegonia (the former corresponding to the stamens, the latter to the pistil in flowering plants), the last containing a special cell, the *oospore*, which after

fertilisation with the antherozoids that have been produced by the antheridia (corresponding functionally with the pollen of flowering plants), germinates and gives origin to a fern plant which produces spores, each capable of giving origin to a similar cycle of changes. In this case there are two so-called generations, the first commencing with the germination of the spore and terminating with the production of the fertilised oospore, at which period the prothallium perishes, this is styled the sexual generation, because the oospore—equivalent to the fertilised ovule in flowering plants—is the *direct* result of fertilisation; the second generation commences with the germination of the oospore and ends with the production of spores on the fern plant, this is the asexual generation, because the spore is not the result of direct fertilisation, and when sown could not give origin to a fern plant without previously producing the sexual prothalloid form. In this instance we have clearly represented only one generation, not two; when once growth has commenced with the spore it goes on uninterruptedly until another spore is formed, the fertilised oospore, which is said to terminate the first generation, not possessing the power of remaining in a state of dormant vitality, as is the case with the seeds of flowering plants, and which marks the end of the individual that gave origin to the seed, but this property is possessed by the fern spore, therefore one generation includes all the changes from the germination of a spore until the production of another similar one. The term "alternation of generations," so far as concerns the vegetable kingdom, simply expresses the fact that when active life has commenced, a series of changes in form and function must be passed through before the starting-point can be again reached, or in other words before a body capable of giving origin to a similar cycle can be repeated. In fungi the "generations" are frequently several in number, but they do not always follow in the same order, the appearance of any one appears to be determined by surrounding causes, so that the plant possesses the property of repeating itself under widely different conditions. In ferns we have seen that the sexual generation is microscopic and disappears—except the oosphere—before the appearance of the large asexual form or fern proper; in mosses, on the contrary, the sexual generation—the leafy part of the plant—is largest and frequently perennial, giving origin to several asexual generations—the capsules. The terms prothallus or pro-embryo are vaguely defined, the latter signifying everything produced anterior to the embryo, consequently when a bulbil of *Lilium bulbiferum* develops into a plant the whole represents a pro-embryo, as would also a potato plant originating from a tuber, both would also be examples of asexual generations, whereas plants produced from seeds of the above would constitute the sexual generation.

G. E. MASSEE.

A CHAPTER ON FISH PARASITES.

By JOHN DAVIES, F.R.M.S.

FISH parasites are a subdivision of the Entomostaca, and are divided into several species. viz. : The Caligulus, having a sucking mouth and a regular series of legs. They are sometimes called "suctorial crustacea." The Argulidæ, which principally infest fresh-water fish. The body is covered with an oval shell, the abdomen is exposed. It has a pair of sucking discs, or feet-jaws, and four pairs of legs more or less articulated and generally plumose. These parasites undergo a number of remarkable changes and cast their shells at frequent intervals. If a limb is lost it is replaced at the next moult, same as crabs, lobsters, &c. These castings take place at intervals of two or three days during some periods of the year. The Argulidæ are mostly found on fish in a weakly state, or on those that have met with some accident, which causes them to be more than usually sluggish; or on those that are by nature inert. The carp offers a striking example of the latter class, and the fact of its being more than usually infested has given rise to a proverb. I do not think the fish suffer in any way from the presence of these creatures—on the contrary, if they feed on cutaneous secretions, it must benefit their host, from a "hygienic point of view."

These parasitic crustacea are very quick in their movements over their hosts, being able to travel backwards and forwards with equal facility. Their peculiar mode of swimming has been described as a "series of tumblings over and over, and darts in a straight line with great rapidity." The fish seem to have a great aversion to these messmates as an article of food, for if by chance one gets down the throat of a fish it immediately ejects it again, and would rather starve than eat it. The female has generally two long oviferous tubes for depositing her eggs (see Article in SCIENCE-GOSSIP, page 33, vol. 1878).

When the young animal comes forth it resembles the Cyclops, and by successive moultings attains the adult form. These metamorphoses do not apply to the males, as they scarcely alter in form and only slightly increase in size.

It is a curious fact that most of these animals when first hatched bear a great resemblance to the creatures immediately below them in point of organisation. Their cast-off shells, after being cleaned by the myriads of minute scavengers (Monads) form most beautiful objects for the microscope. They should be examined with the half-inch objective in conjunction with the spot lens, and as permanent objects can be preserved in a solution of chloride of calcium, or glycerine-jelly.

There is a great difficulty in examining these small crustacea as they soon perish after leaving their native element, and in fact they seem bent on committing self-destruction, as they generally climb out of the vessel in which they are placed, and soon end their existence. The Caligulus was first-mentioned by

Baldner, a self-taught naturalist (a fisherman) of Strassburg, about 1700. In 1749, Frisch, in his "Insecten in Deutschland," describes it as *Fisch-laus*. Linnaeus in his "Systema Naturæ," mentions it as the *Monoculus foliaceus*. The best description, however, is given in "Ann. et Mus. d'Hist. Nat." for 1806, and at the present time this article is largely quoted. The *Argulus* was first noticed about fifty years after the *Caligulus*, and several mistakes seem to have been made, one author actually mistaking the tail for the head. This was a pardonable blunder, as the use of the microscope was little known in those days. It, however, led to a great amount of confusion, as each writer, copying the remarks of those before him,

six layers of bronchial lamellæ finely marked, and are used for sucking the juices of the fish, or from the mucous products secreted by the skin. Between these suckers is a round sinus, whose functions I do not know; from near this opening commences the alimentary canal, which runs through the centre of the parasite, throwing off "cæcal prolongations," and terminating between the caudal appendages, where is situated the cloaca.

The primary canal contains the cesophagus, stomach, and intestines. Below the sucking discs is a pair of foot-jaws serrated in their inner edges, which are used for masticating the food. In the centre of these jaws is situated the mouth. Leydig describes the mouth

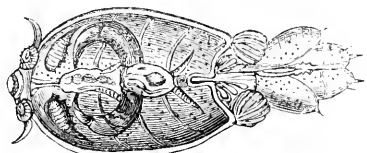


Fig. 75.—Parasite of wrasse (ventral view). Scale, $\frac{1}{8}$ inch.

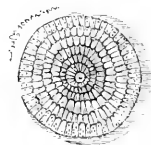


Fig. 76.—Sucker of parasite of wrasse; $\times 310$.

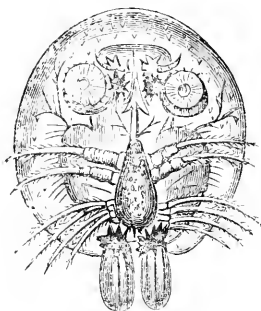


Fig. 77.—Parasite of bass (ventral view); $\times 25$.

caused an accumulation of errors. Milne-Edwards' "Hist. Nat. des Crus." gives a full and good description in 1840, and since that time several American and Continental writers have greatly increased our knowledge on the subject.

The following is a description of two minute parasitic crustacea which were taken from living specimens, and which differ in some particulars from any hitherto recorded. They give but a vague idea of the wonderful organisation and beauty of form of these minute beings, which are so perfectly adapted to perform all the functions designed by Providence for these lowly creatures.

This parasite (fig. 75) is oval and slightly convexed. It is divided into two parts, the thorax and the abdomen; the thorax coalesces with the hind part, which is sometimes, but erroneously, called the tail. The posterior part contains the swimming-legs. In this individual the thorax is composed of a shelly carapace strengthened by a series of bands diverging from the centre. This shell extends to about three-fourths of the length of the parasite. The remainder consists of four segments of a soft sarcode interspersed with small pink puncta.

The last pair of segments has a distinct band which serves to divide it transversely. A pair of sternal forks is placed at the termination of the abdomen. The cephalo-thorax is composed of a shelly transparent substance, and according to Pickering and Dana, is formed of two layers or substances. The head is blunted and contains a pair of antennæ, which in some individuals is at right-angles, and in others is turned upwards. Between these antennæ and the centre of the head is a pair of lunules or sucking-discs (see fig. 76) which are composed of about

in the *Argulus foliaceus* as follows: "The opening of the mouth is placed in a club-shaped projection bent downwards. It is divided posteriorly by a crescent-shaped lower lip, anteriorly and laterally by two broad gradually tapering plates, several disc-like pieces inside representing the mandibles."* M. T. Thowell observed "two small teeth."

A little below the gullet is a pair of thoracic feet graduating from the carapace to the termination, and curved so as almost to meet at their extremities. These legs are covered with a series of triangular scales, which gives them the appearance of being irregularly segmented. Under these locomotive appendages is another pair, much thinner and turned towards the posterior. Between the shell and the abdominal part is a pair of fan-shaped fins composed of six cartilaginous ossicles and covered with a fine membrane. These parasites have two simple oval eyes. This *Caligulus* was taken from the Green Wrasse (*Labrus lineatus*). Colour, *opal white, with dark crimson markings*. Fig. 77 is an individual of the genus *Argulidæ*; there are only two or three species known. It is of a pale green colour and about $\frac{1}{16}$ inch each way, being nearly round. The membranous carapace is covered with a peculiar V-shaped marking, and forms a shield over the whole of the body. The fore-part is obtusely round, it has a pair of perfect eyes, very dark and brilliant;

* On the "Morphology of the Argulidæ," 1866.

antennæ above the eyes, short and pointed, and are scarcely seen. Between the eyes commences the alimentary canal, which leads to a long oval dark mass, which is supposed to contain the mouth, cesophagus, &c.

Situated on either side of the optic nerves is a pair of remarkable organs which are both legs and suckers, according to Dr. Baird* they are: "The anterior pair or second pair of foot-jaws, and of a peculiar construction. They are in the form of short hollow flexible cylinders . . . having a membranous margin and figured all round with membranous rays . . . by this organisation the animal can make use of them as real suckers or cupping glasses and fasten itself to the fish on which it lives, and also to walk with when it wishes to change its position. By contracting these muscles it can exhaust the cavity of the sucking disc, producing a vacuum, and this enables it to adhere firmly to the surface upon which it is placed." By Dana and Herrick they are called "prehensile feet." About midway are placed two pairs of long and beautifully formed legs, and further below are four more pairs also plumosed and carried towards the posterior.

The abdomen consists of a pair of lobed oval appendages, or perhaps egg-corpuscles, and are marked with longitudinal lines about eight in number.

At the commencement of these ovate organs are two bright crimson star-shaped markings which are said not to be observable in the male. Between these appendages terminates the intestine canal, and here is situated the anal orifice.

This species was found on the gill of the Bass (*Labrax lupus*).

ON THE MITE OF THE HUMBLE BEE GAMASUS.

I SHOULD like to draw the attention of students of the Arachnoida to a minute mite, which I have frequently found parasitic on the *Gamas* infesting queen humble bees. I first noticed it, I think, in the spring of 1877. I suppose it must be the *Hypopus* (whatever that may be) of Gamasus, but it differs so remarkably from all other Hypopi that I have seen, or indeed from all other mites with which I am acquainted, that I should like to know more about it. I have found as many as seven specimens on a single Gamasus. The humble bee on which I first found it in 1878 was the *Bombus virginialis* of Kirby. It moves about on its host with tolerable speed, giving one an idea of a pigmy tortoise; it is covered with a shield of a brownish-yellow colour, like some specimens of resin, shining, and very evidently divided into an anterior or cephalic, and posterior or dorsal portion. The legs are very re-

markable, the anterior pair being rather short, broad and flattened, and each front leg is provided with a peculiar and large single claw, like that found on the three first pairs of legs of *Trichodactylus Osmie*, from which mite it differs also, in having the chitinous shield, instead of the corrugated skin so characteristic of the Sarcopitidae. The second and third pair of legs are much finer, rather longer, and furnished with a double claw and large pad. The hind legs terminate in a few long stiff hairs, somewhat like *Trichodactylus*, only in that creature there is but a single terminal hair to each hind leg. The mouth

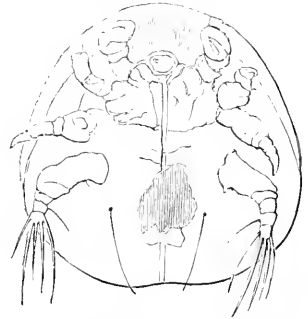


Fig. 78.—Mite from Gamasus of Humble bee; X about 220.



Fig. 79.—Front leg (a) with claw, middle feet (b) and pad, and hind leg (c) of Gamasus.



Fig. 80.—Scale, $\frac{1}{1000}$ inch.

parts I have not been able to make out satisfactorily, but it appears to be furnished with two bristles, as in *Hypopus muscarum*. The abdomen gives one an idea of segmentation.

The readiest way of finding them, is, first to catch the early queen humble bees when they frequent the catkins of the willow: these are almost invariably invested with the desired Gamasus (which is exactly like *G. coleopterorum*). Place one of the bees under a wine-glass, or tumbler, and introduce a small piece of blotting paper moistened with hydrocyanic acid. This will speedily kill the bee, but

* "Natural History of British Entomostraca."

* Their structure is simple and fructification though various in power, always sporiferous.

before it is quite dead, the Gamasi will leave it, and run about in all directions; as soon as they are stupified, examine them one by one under the microscope, when the hypopi if present, will be found attached to some portion of the Gamasus, and may be removed, with care and some trouble, by using a dissecting needle. On placing one or more on a glass slip, and waiting a little while, it will be found that they are not dead (unless they have been exposed to the vapour of the acid for too long a time) and when they come round, they will walk with tolerable ease on the glass, although the front pair of legs are of very little use to them under such circumstances; and this is the most favourable time for observing the large claw, for in walking on glass it is protruded a little way beyond the shield. When alive on the Gamasus they cling to it by means of these large claws, and in this state, the claw or leg will often be torn off in trying to remove them with the needle.

I have not the works of Dujardin or Claparède on this subject; but if any reader of SCIENCE-GOSSIP possesses them, and would kindly lend them to me for a short time, I would take great care of them, and gladly pay the carriage of them both ways.

Kirton Lindsey.

C. F. GEORGE.

THE HISTORY OF RHUBARB (*RHEUM*).

BY H. G. GLASSPOOLE.

RHUBARB is a plant belonging to the Polygonaceæ, the same order as the common dock and buckwheat, to the latter family of which it belongs. The use of the roots of this plant for medicinal purposes is of great antiquity, and it is uncertain to whom mankind are indebted for the discoveries of its virtues. Its valuable properties appear to have been known to the Chinese long before the Christian era, as it is stated in the Pharmacographic that this drug is treated of in the herbal called Pen King, which is attributed to the Emperor Shen-mung, the father of Chinese agriculture and medicine, who reigned about 2700 B.C. Dioscorides, physician to Antony and Cleopatra, wrote on its qualities, and recommended it against weakness of the stomach, diseases of the liver; and as an external remedy, he mentions it as a cure for ringworm, if it be mixed with vinegar and the place be anointed with it. Dioscorides says the rha, by some called rheon, grows in those countries which are beyond the Bosphorus, and from which it is brought. It is a root which is black externally, like the great centaury, but smaller, redder, odourless, loose or spongy, and somewhat smooth internally. The Greek physicians of a later date, as Alexander of Tralles, and Paulus, of Ægina, have written upon its virtues; and Pliny gives a similar account as that of Dioscorides to a plant which he calls rhacoma. The ancient Arabs were acquainted with this plant; one of their authors,

Mesne the younger, mentions three kinds—the Indian, the Barbarian, and the Turkish. The recommendations of the medicinal virtues of this root by later practitioners would fill many volumes; as an article of commerce it has been of considerable importance for many centuries. All the species of rhubarb are natives of Asia, and grow spontaneously on the elevated lands of Tartary, Tibet, India, &c., and also on the banks of the Volga. We have no account of this plant being cultivated in England before 1629, although it is stated in some of our old works on gardening that the leaves of rhubarb were commonly used as a pot-herb in the reign of Elizabeth, and considered superior to spinach. Tusser also mentions it as a medicinal plant for the “Herbe garden;” this was no doubt monk’s rhubarb, mentioned by Gerard as grown in his garden and others in London and elsewhere for the use of “phisick” and “chirurgie.” He calls it “*Rhubarbarum monachorum*, Monks’ rhubarb.” This plant did not belong to any species of rheum, but appears to be *Rumex alpinus*, an Alpine dock which grows in Switzerland and Germany, the root being more astringent than purgative, is used by the monks of the Alps to adulterate the true drug. Although we have no account of the cultivation of rhubarb before the date previously mentioned, the seeds of the plant appear to have been sent to this country as early as 1534, for in a postscript of a letter of the above date, from that eccentric physician Andrew Broide (or Brode) to Cromwell, secretary of state to Henry VIII., he says, “I have sent to your Mastership the seeds of reuberbe, the which came out of Barbary. In those parts it is considered a great treasure.” He also gives directions for sowing and transplanting the roots, at least two hundred years before the cultivation of it was known in England.*

Rheum rhaponticum, the common garden rhubarb, was first grown in this country in 1629 by Parkinson, who informs us that the seeds were sent him from beyond the seas by a worthy gentleman named Dr. Matt Lister, one of the king’s physicians, and first grew with him before it was ever seen or known elsewhere in England,† but it was only grown as a curiosity or for medicinal purposes, and was not generally cultivated: as we find Professor Bradley, in his “Husbandry and Gardening,” published in 1724, saying, “I could wish that we could get some of the true rhubarb, if possible, for this has not yet been grown in Europe as I could ever find, though once I remember the late ingenious Mr. Jacob Robart thought he had got it.”

Rheum palmatum, another species grown in gardens, was first introduced in 1763 by Dr. Mounsey, who procured the seeds from Russia. The plants were grown in the botanical gardens of Edinburgh and Cambridge, from thence they were quickly dispersed

* Ellis, “Original Letters,” 3 ser. vol. ii. p. 300.

† “Parad.” 484.

over the island. Pennant, in his second tour in Scotland, 1769, mentions having seen large quantities of rhubarb being cultivated on the wild tracts of that country by way of trial to see if it would succeed as well there as in manured soils.

Mr. Charles Bryant, of Norwich, gives an interesting paper in the "Gentleman's Magazine," 1766, p. 444, on a plant of *R. palmatum*, grown in his garden in Magdalen Street. After giving a botanical description of it, he proceeds to say that about the end of May the flowers were almost all blown to the very top of the flower-stem, and the whole consummated a scene which not only merited the inspection of the curious botanist, but gave delight to the delicate eye of the most luxurious florist. The seed that produced this plant was sown in the open ground in the botanic garden here (Norwich), April, 1763, where it stood and flourished till November, 1765, when it was taken up. A piece of its root came off, which was copiously stored with a fine thickish saffron-coloured juice of a very agreeable aroma to smell, so volatile that it scented the whole garden. Half-an-ounce of this fresh root, thinly sliced and steeped twenty-four hours in half-a-pint of gin, made a most agreeable sparkling saffron-coloured tincture, about half a gill of which, taken upon an empty stomach, was found a very good cordial.

R. rhaponticum was largely cultivated for medicinal purposes at Banbury, Oxfordshire, in 1777, by Mr. Hayward, who was rewarded by the Society of Arts in 1789 with a silver, and in 1794 with a gold, medal for the excellency of the drug he produced. The same society also presented Sir W. Fordyce a gold medal for raising rhubarb from seeds in 1792.

It was not, however, until the beginning of the present century that the stalks of rhubarb became an article of commercial importance in the London and other vegetable markets in the kingdom. About 1810, Mr. Myatt, of Deptford, sent two of his sons to the Borough market with five bunches of rhubarb stalks, of which they only sold three, people not liking what they called *physic pies*. Notwithstanding, Myatt continued its cultivation. As he predicted, it soon became a favourite; and now hundreds of tons' weight of rhubarb are sold in Covent Garden in the course of the year, and what amount in other markets all over the country it is impossible to calculate.

The various uses of this plant in the kitchen department is well known. The petioles in the spring and early summer are employed in tarts, &c., and when the leaf stalks are too old for cooking, the express juice from them is manufactured into a wine closely resembling champagne; indeed, much of the common champagne drunk in this country is often nothing more than a preparation from the stalks of rhubarb and the fruit of the gooseberry. The large globular pouch of unopened flowers when cooked as rhubarb form a dish of great delicacy. Its chemical composition is very complicated, and chemists have

failed to discover any peculiar principle in the drug which fully accounts for its purgative properties. The analyses of Schlossberger and Döpping discovered a variety of new principles in it, among which was chrysophanic acid, a beautiful yellow substance emitting yellow vapours when heated, soluble in alcohol, its alkaline solution changing by evaporation to a violet and then to a blue. Magnificent purples also are obtained from the yellow colouring matter produced by heating rhubarb with nitric acid and then with alkalis, and it has been proposed to apply these, called erythrose in the arts, as a dry stuff.* Bryant tells us a decoction made from the fresh roots of rhubarb is an excellent antiscorbutic, and in this respect is no way excelled, if equalled, by a decoction of the so much celebrated water dock, *Rumex* *hy-drolapathum*, which is still in the present day taken for scorbutic diseases by the rustics in the Broad districts of the eastern counties. The poor in some parts of Scotland are said to apply heated rhubarb leaves to parts affected by rheumatism, which they say gives ease to the pain. The leaves are said to be used in the fabrication of fictitious cigars and tobacco.

To the botanical microscopist the rhubarb supplies excellent specimens of spiral fibrous structures, as spiral annular and reticulated vessels and ducts, the petioles, leaves, and roots contain bundles of stellate raphides, oxalate of lime (which gives a grittiness to the drug), which make beautiful objects for polarized light. The original species of *R. rhaponticum*, *undulatum*, and *R. palmatum* have now been superseded in our gardens by hybrid varieties possessing the merits of larger size, delicacy in texture, and coming earlier into use.

Rheum officinale, from which the drug is obtained, was first grown in this country by the late Daniel Hanbury, F.R.S., who sent specimens to Mr. Usher, of Banbury, where it is now being cultivated for medicinal uses. This species is a native of the south-east of Tibet. Some species of rhubarb are highly ornamental in many situations in pleasure grounds, &c., their luxuriant foliage and tall elegant spikes and flowers contrasting so singularly with most of our native plants. The generic name *rheum* is derived from *rha*, the ancient name of the river Volga, from which locality it is supposed the Greeks first received it.

FIELD MOUSE AND BEES.—I keep several hives of bees, and have placed pieces of perforated zinc about three-quarters of an inch broad at the mouth or door of each hive to prevent vermin, but the other day on going to look after the bees, I found a field mouse had entangled itself in the zinc in coming out of the hive; it was dead, and appears caught by its hind quarters, and I suppose stung to death by the bees. Is not this a very curious circumstance?—J. Lloyd Phelps.

* See Ripley and Dane, "American Cyclopædia."

ON THE AMBULACRAL SUCKERS AND PEDICELLARÆ OF *ECHINUS MILIARIS*.

By MAJOR LANG.

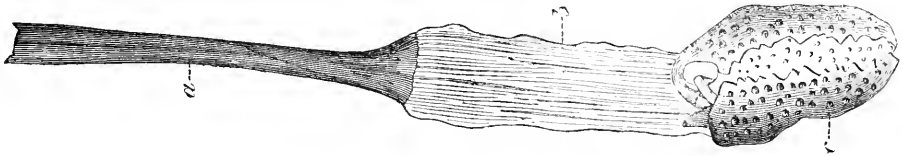
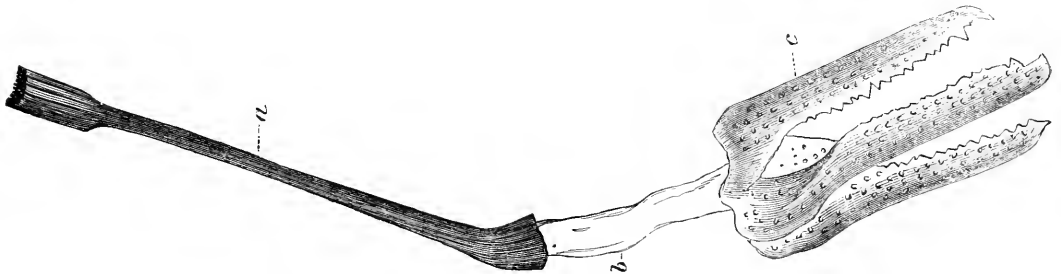
WHILST residing lately at Torquay, I carefully studied the exterior organs of *Echinus miliaris*, which is to be found there in considerable abundance, under the stones at low water off Corbon Head. I allude more especially to its ambulacral suckers and those curious and little-understood appendages, the pedicellariæ.

If a dead and dry specimen of *Echinus*, popularly called the sea-urchin or hedgehog, is examined by a novice, he is at a loss to understand how the little creature is enabled to creep, as it does, under and over the rocks and stones in its native element.

Its calcareous shell is entirely covered and almost hidden by sharp-pointed spines, whilst the mouth,

ambulacral perforations that the tubular sarcodic tentacles, surmounted by their sucker-like disc, are attached; each of the five plates or segments of the test are covered with tubercles arranged in longitudinal rows, the summit of each tubercle being surmounted with a polished nipple, on which the base of the spine, which is slightly hollowed out for the purpose, rests, so that they form together a perfect ball and socket joint, employed therefore by nature long before man had ever adopted it.

Having learnt thus much it will be well to go down to the shore during low water, and obtain some living specimens, which, as the creatures are tolerably tenacious of life, can be brought home in some fresh seaweed. A bottle of sea water must be also procured. On arriving at home, put the *Echini* in a white soup plate and pour in the salt water. The beautiful lilac and green tints of the spines, as they languidly move in their sockets, will be first observed,

Fig. 81.—*Pedicellaria triphylla*, &c. of *Echinus miliaris*.Fig. 82.—*Pedicellaria tridens*. a. calcareous stem, b. extensile neck, c. head.

which is placed on the under side, is surrounded by a naked membrane. But if he looks carefully with a pocket lens he will perceive, between the bases of the spines, and more especially between those nearest the mouth and on the periphery of the buccal membrane, a great number of very minute discs apparently attached to or resting on the shell. These are in reality the organs of locomotion, the ambulacral suckers, which the animal can protrude far beyond the extremities of the spines by a method which will be explained presently. Now if he will rub off the spines, which he can easily do, he will see that the test or shell is composed of five wedge-shaped segments, the apices of which meet at the top, and that dividing these, or joining them, if you please, are five ribs, each of which is furnished with two rows of puncta or holes completely perforating the shell, as can be proved by simply holding it up to the light and looking through its interior; and it is on these

and then many of the ambulacral suckers will be seen extended far beyond these by their diaphanous sarcodic tubes. The slightest touch will cause them to retract, but with a sharp pair of scissors that portion of the tubes beyond the spines with its suckers may be cut off, the tube however shrinking up into almost nothing towards the suckers. Remove this to a watch glass into which a few drops of water have been placed, and examine it under the microscope, when it will be seen that the sucker is strengthened by an interior circular skeleton, and that the tube has fallen into corrugated folds. Replace the water by some liquor potassæ, and let the specimen soak in it for a day or two. The potass will act upon and destroy the sarcodæ, and a beautifully reticulated calcareous disc or rosette with a scalloped margin and central orifice, like a delicate piece of network will be revealed, composed of from three to seven wedge-shaped segments, which, if the action of the potass be

much longer prolonged, will be separated from each other. There are a vast number of these ambulacral suckers on the entire test, and by their aid the creature not only drags itself along, but anchors itself to the rocks, and so tenaciously, that it requires considerable force to detach it; indeed, sooner than let go its hold, I have found that it will allow the suckers and tubes to be torn from it, and they have been left on the bottom of the plate to which it had been clinging. In fact this is the best way of obtaining specimens for microscopic investigation. By means of those on the upper portion of the shell the animal is able to right itself if thrown on what we may call its back, and by their aid also it can, and does often, completely cover itself with pieces of seaweed, for the purpose, I presume, of concealment from its enemies.

The method by which these suckers are extended or retracted at the creature's will is interesting. In the

muscular bag filled with fluid is attached to the same. When the sucker is to be protruded the muscles of the interior bag contract, whilst the longitudinal ones of the tube are relaxed, and consequently the fluid expelled from the bag passes through the two pores and entering the tube extends it. When it is to be retracted, the process is of course reversed; the longitudinal muscles of the tube contracting, whilst those of the bag relax, so that the fluid can re-enter it.

I need scarcely remark that in the sucker of the Echinus we have another example of a mechanical power in nature that has existed for ages, and that it has been unconsciously reproduced in the school-boys' well-known leathern sucker.

Let us now turn our attention to those extraordinary appendages, the pedicellariæ, which have always been, and still are, a puzzle to naturalists. What their functions may be, and what use they are to the animal, is still a question which will be alluded to

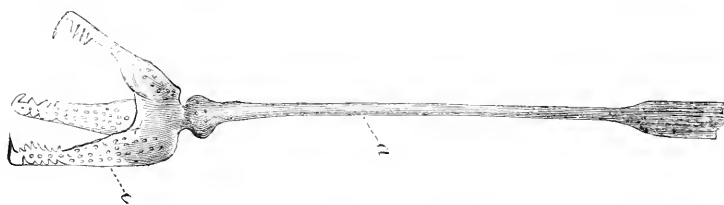


Fig. 83. — *Pedicellaria globifera*.



Fig. 85. — Single blade of Fig. 81. (*Pedicellaria triphylla*.)

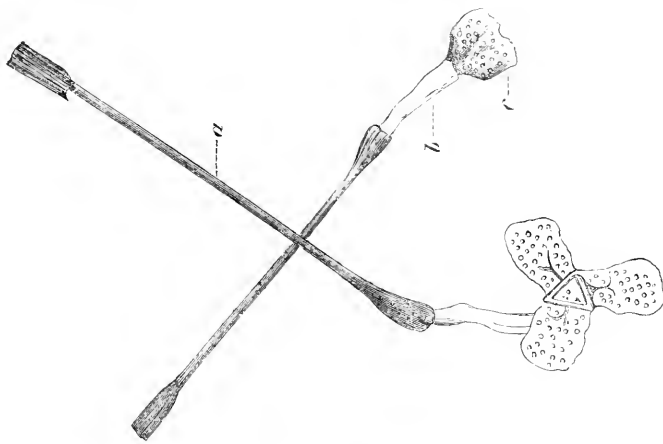


Fig. 84. — *Pedicellaria stereophylla*, open and closed.

first place it may be seen under the microscope that the tubes are furnished with both longitudinal and annular muscles, the former for lengthening and shortening them, the latter for increasing or diminishing their calibre. I have said that there are five pairs of ambulacral rows of pores. Now if a portion of one of these meridional primary rows is carefully examined, it will be found to consist of numerous subordinate diagonal ones, each of which is made up of three pairs of pores. The tube of the sucker covers and embraces one of these pairs, and within the test a

presently. I will only remark here that similar organs are found in some of the star-fishes, and in a few of the polyzoa. The Echinus has no less than four different kinds of pedicellariæ, distinguished by the names of Triphylla, Tridens, Globifera, and Stereophylla. I have found them all, with the exception of Globifera, on the naked membrane surrounding the mouth, the latter seems to be con-

fined to the bases of the spines, whilst Triphylla, by far the most abundant, is also scattered generally over every portion of the shell. Although the form and size of the different species differ considerably, their general plan and structure are identical. A calcareous and more or less fibrous stem, enlarged at either end like a double drum-stick, is anchored at its base to the naked membrane round the mouth, or to the shell by its sarcodic envelope, which, clothing the entire length of the stem, protrudes far beyond its free end, except in the case of Globifera, forming an extensile flexible

neck on the top of which is perched the head, consisting of three beautifully reticulated forceps-like blades or jaws, armed, except in the smallest kind, *Stereophylla*, with strong sharp serrated teeth. In *Globifera* the head is placed directly on the stem without any intervening neck. In their natural state these calcareous heads, as well as the stems, are clothed with a sarcodic covering, especially abundant and dilated in *Globifera*. But when treated with potass this is dissolved, and the skeletons only left.

It is an interesting experiment to cut out with a pair of scissors, which can be easily done, the membranous portion surrounding the mouth of the *Echinus*, and detaching it from the five prominent teeth protruding through it, and familiarly known by the fanciful name of Aristotle's Lantern, to place it in some sea-water on a glass slip under the microscope. The animal must be undoubtedly dead, but on the severed portion under examination the pedicellariæ will be seen still in a lively condition, bending their extensile necks in every direction, and opening and shutting their three-bladed jaws.

I have now only to add a few words on the possible functions of these pedicellariæ, though nothing is known conclusively on the subject. Their first discoverers considered them to be parasites perfectly independent of their hosts; but this cannot be the case for various reasons, as in the first place they are invariably present in the same numbers and in the same position, which would not be the case were they adventitious; and secondly their skeletons are formed of precisely the same material and on exactly the same structural plan as that of the creature's test on which they rest; whilst the sarcodic envelope surrounding them is a mere continuation of that which clothes the entire shell as well as the spines upon it. Perhaps the best suggestion as to their use is, that they catch and hold in their grasp the small crustaceans swimming past, and that these, dying and decaying, attract around them clouds of minute infusoria, which eventually become the prey of the *Echinus*; but this is a mere theory which must be taken for what it is worth.

MICROSCOPY.

CEMENT FOR GLYCERINE.—Every one who has had much experience in microscopy recognises the extreme value of glycerine as a mounting medium, but the evil reputation it enjoys for "leaking" has much restricted its use. The cements in common use are not to be relied upon. Dammar varnish, so strongly recommended by some, becomes so saturated and softened that after a few months, cover, specimen and cement may often be wiped off the slide with the greatest ease. Even good gold size is not safe, and I believe chiefly for the reason that many bad specimens of this varnish are in the market. Having experienced

much inconvenience from the want of a reliable cement, I am glad to believe that I have at length succeeded in obtaining one. The description is to be found in Dr. Marsh's book on "Section Cutting" (a notice of which you gave recently), and as the information will doubtless be welcome to many besides myself, I send you the following extract, which perhaps you may consider worthy of preservation in your pages. "The great drawback to the use of glycerine is the extreme difficulty experienced in preventing its escape from beneath the covering-glass, for it unfortunately possesses such great penetrating power that no cement hitherto devised can be thoroughly depended upon for withstanding its solvent action for any considerable length of time. Attention to the instructions however presently to be given will however reduce this risk of leakage to a minimum: after clearing away all superfluous glycerine from round the cover, with a very small camel's-hair pencil, charged with solution of gelatine, a ring must be made round the margin of the cover of sufficient breadth to take in both cover and slide. As this cement is perfectly miscible with glycerine, it readily unites with any of that fluid which may ooze from beneath the cover and which in the case of any of the ordinary varnishes would act as a fatal obstacle to perfect adhesion. To make the cement, take $\frac{1}{2}$ oz. of Nelson's opaque gelatine, put it in a small beaker, add sufficient cold water to cover it, and allow the mixture to remain until the gelatine has become thoroughly soaked. The water is now poured off and heat applied until the gelatine becomes fluid, when three drops of creosote should be well stirred in and the fluid mixture transferred to a small bottle to solidify. Before use this compound must be rendered liquid by immersing the bottle containing it in a cup of warm water. When the ring of gelatine has become quite set and dry (which will not take long) every trace of glycerine must be carefully removed from the cover and its neighbourhood by gently swabbing these parts with a large camel's-hair pencil dipped in methylated spirit. After drying the slide, a ring of Bell's microscopical cement may be applied over the gelatine, and when this is dry another coat is to be laid on. If it be desired to give to the slide a neat and tasteful appearance it is a very easy matter by means of the turntable to lay on a final ring of Brunswick black or white zinc cement."—*William Briars, Hackney.*

MICROSCOPE IMPROVEMENTS.—In an important paper recently read before the Chichester National History and Microscopical Society, on "Microscopes," Mr. F. J. Freeland reviewed the most noteworthy improvements which have been made in objectives, both at home and abroad, within the last five years. Among other subjects, he said that "a new eighth and a twelfth, designed by Professor Abbe, for use with oil of cedar, and, to obviate screw collar adjust-

ment, for varying thickness of cover glass, upon objects, is very highly spoken of by leading English observers. If this work without counterbalancing objections, a revolution in the future of objectives may be expected. The object must be somewhat specially mounted. Danger that the fluids may intermingle under necessary traversing when a living object in water is examined with a water immersion lens is not lessened by oil substituted, and Mr. Dallinger rejoices that high power English dry lenses, usually, suffice for investigation of minutest living things, from the study of which, as he remarks, so much may be anticipated."

MOUNTING POLYZOA, &c.—Mr. Thomas Lisle, of Wolverhampton, gives in the "Midland Naturalist" for March, the following process for mounting these objects:—"Place the polyzoa in a deep cell with some of the pond water; let them remain undisturbed until they have expanded their tentacles, then suddenly let fall a drop of alcohol into the cell. This kills them instantly. The cell is then filled with distilled water or glycerine, and sealed in the usual way. Rotifers may be treated in the same manner, but the cell may be shallow."

CELLS FOR DRY OBJECTS.—We have received from Mr. H. P. Aylward, of Manchester, some prepared cells, which we believe may be useful to those who mount many dry objects. They are made, either of paper, or cloth rings, well coated with, we believe, a shellac varnish, which becomes hard and glossy, and when the objects are to be mounted the application of heat melts these rings to the slip and fastens on the thin cover. Their use is of course limited to those objects which will bear heat, but most foraminifera and other calcareous organisms and many microscopic fossils can thus be rapidly mounted, for as soon as the slide is cold the varnish becomes quite hard and there is no danger of the object becoming attached to the edge, which sometimes happens when rings are fastened on with gold size or other varnish. The thin glass when it is being attached should not be touched with a cold needle, or condensation takes place under the point; but if this is avoided we have found the glass remains quite clear, and the object is in no way obscured. It would seem as if the attachment is likely to remain permanently hard and firm, but that can only be proved by lengthened experience.

NEW SPECIES OF RHIZOPODS.—In the "American Quarterly Microscopical Journal" for January, Professor W. S. Barnard describes some new kinds of American Rhizopods. As a rule, the American species are of European genera, and it is very seldom a new one is discovered. Our species (*Euglyphia tegulifera*), appears to be a very interesting form, on account of its peculiar shell. It was found among fresh-water algae near New York. We take advantage of this opportunity to express our high opinion of this well got up and excellently edited journal.

REMOVING AIR-BUBBLES.—Mr. F. C. Clarke, in the "American Naturalist," gives the following method as practised by Dr. Johnson: The apparatus he employs is of very simple construction, being a common dentist's vulcaniser, the means—steam. The preparations to be thus treated, especially those of wood, are prepared in the usual way and made ready for mounting. They are next placed in a small vessel of any material which will resist a certain amount of heat. Dr. Johnson uses a small glass phial in his experiments: this is filled up with water after all the specimens (as many as it can conveniently hold) are placed within. A cork can be used, but a slit must be cut in it to allow the escape of air and the admission of steam and hot water. A little water is now poured into the vulcaniser, the bottle of objects placed within, and the lid of the machine screwed down air-tight. The whole is now heated to a temperature of about 300° Fahr. for a few minutes. This temperature is sufficient for all practical purposes. When sufficiently cooled the phial is removed, the water drained from the bottle, and alcohol substituted. The specimens are now ready for mounting. By this process the specimens are made absolutely free from air, for the steam penetrates and forces out the air from the objects operated upon; and the tissues remain undestroyed.

ZOOLOGY.

PLANORBIS MARGINATUS.—Professor Ralph Tate in his work on "British Mollusks," says, *Planorbis marginatus* is unknown in Scotland. Perhaps it may interest some of the readers of SCIENCE-GOSSIP to know that I have lately taken upwards of a dozen specimens from Duddingston Lock, Edinburgh. Also specimens of *P. carinatus*, *P. Nautilus*, and *P. contortus*, the last-named species is very numerous.—*John Adams.*

THE ECHINUS IN AQUARIA.—Would any of the readers of SCIENCE-GOSSIP inform me of the cause of the absence of the Echinus in our large aquaria? Is it that animals found in deep sea dredging, will not flourish in these, or is it a difficulty as regards supplying it with proper food? I have never succeeded in keeping them in small aquaria for more than a short time; the last brought me on December 7 lived for a month, the spines then began to fall off quickly, and in a day or so it died. The Echinus is such an interesting inhabitant of an aquarium, that I should be very glad to know if it is possible to keep it for any time in captivity.—*M. D.*

THE HOODED OR ROYSTON CROW (*Corvus cornix*).—These noble birds have been numerous in this neighbourhood for some weeks, one or two will occasionally perch on the rails of my garden fence,

they seem less timid at the approach of man than their congeners the rooks.—*J. M., New Brompton, Kent.*

THE COLOUR SENSE IN CATTLE.—The degree in which various species of animals are able to appreciate colour has lately been the subject of discussion. It seems to me that the displeasure shown by cattle at scarlet or blood-red objects is presumptive evidence that they can discriminate between these shades and the dull brownish-red so common in their own species. It might indeed be contended that like certain birds they take offence at colours bordering upon their own. But I have never heard that the dislike of redness is at all confined to red cattle. On the contrary, it is manifested by wild species of the ox tribe, which are never red, and by the wild cattle of Chillingham and Lyme park, which are uniformly white. Does any correspondent of SCIENCE-GOSSIP know an instance of any animal being excited to anger by blue, yellow, or orange objects?—*J. W. Slater, Aylesbury.*

MISTAKES MADE BY INSTINCT.—It has struck me that it would materially help to advance the new study of comparative psychology, if our correspondents would put on record good and well-authenticated illustrations of the mistakes made by animals. We hear much of their marvellous instincts, but notwithstanding, there is a tendency to magnify their character, and little or nothing is said of the mistakes of instinct, whereby we might learn even more of animal psychology. I refer to such mistakes as that made by the humming-bird hawk-moth, fluttering over the artificial flowers of a lady's bonnet, or a bee which buzzed into the grip of a sea-anemone, as recorded by Jonathan Couch.—*J. E. Taylor.*

HOUSE-FLIES AND THEIR PARASITES.—In reply to the request of the Rev. W. Marston Beeby, concerning the parasite described on page 21 column 1 in SCIENCE-GOSSIP, I can unhesitatingly assure him that it is the well-known fly-parasite called Chelifer, the surname of which used to be Fasciatus; but in a slide I have (prepared by Mr. Cole, see the bottom of the second page of your advertisement wrapper) it is labelled Cancridos. Mr. C. can, probably, supply the object; but he has added to the label the words "very rare." In truth I have never seen but one in life, and that was, as your correspondent describes, adhering with wonderful tenacity to the leg of a common house-fly, *Musca domestica*. Mr. B. compares the claws of this insect to those of the lobster, but they are still more like those of the scorpion, and, in fact, the common name is scorpion insect; it is a perfect scorpion all but the tail. Its having eight legs shows it to belong to the great family of spiders, and therefore, in strict definition, is not an "insect" at all, as no insect proper has more than six. There is another variety of this kind still more striking and curious, the *Obisium tremuloides*, but which is still

more rare and hard to meet with, and is the true lobster insect. I have two slides of it, but have never seen it in life. But to return to the Chelifer, I will transcribe a passage from that very useful and pleasing little work entitled "Objects for the Microscope," by the Rev. L. Lane Clarke (London: Groombridge & Sons: 5 Paternoster Row). "Chelifer; this parasite attacks flies. I have seen a common fly run wildly about the window-pane, shaking itself violently, and apparently in great distress. Upon catching it, I found a small scorpion-like creature fixed upon one of its thighs by a pair of tremendous claws. Hardly could it be detached for examination, and then it ran quickly like a crab, sideways. The Chelifer belongs to the *Trachean Arachnida*; that is, they breathe by means of trachea and spiracles, and not as the higher order of spiders, by lungs, or internal gills. They have eight legs, two long palpi, armed with claws, the eyes are at the side of the thorax, and the flat abdomen is jointed." In conclusion, I would add a few words upon the question whether the Chelifer is a parasite, or merely an occasional foe of the fly? From its extreme rarity I should undoubtedly say the latter; that is to say, if by "parasite" is meant something bred upon another animal; just as mites are upon a piece of stale cheese, for example. The reason why the Chelifer, when caught in the house, is usually found on the "window-fly" is because, as every one knows, it is by far the most common domestic insect, as its name of *Musca domestica* clearly indicates; but I have no doubt that the Chelifer would make equally free with the leg of a *Tipula oleracea* (Daddy Long-legs) if it happened to come in his way.—*H. U. J., Exeter.*

DESIGN IN THE NESTS OF BIRDS.—At a recent meeting of the North Staffordshire Field Naturalists' Club Dr. M'Aldowie read an excellent paper on the above subject. He said in no class was the special design for the protection of offspring better seen than in the bird class. The great majority, especially the weak, trusted to concealment, which was effected first by the location of the nest, usually of some inconspicuous material, in bushes, holes, trees, and banks. A second method of concealment was by constructing the nests of material similar in appearance to that which surrounds it. This was adopted by the chaffinch, the common wren, and the martin. Thus the chaffinch would place its nest in the fork of a tree, and construct it so cunningly of mosses and lichens that it had the appearance of an excrescence on the branch. Dr. M'Aldowie had noticed a striking illustration of this method in the cliffs along the coast of Kincardineshire, where the martins built their nests in the granite or gneiss of material exactly similar in appearance. The third form of concealment was in the colour of the eggs being much like the soil on which they are laid. This was seen in the lapwing and skylark. They often choose the side of a small

mound for their nests, to be able the better to watch those who would attack them. Their young were also coloured to resemble the soil, and therefore could not be easily seen by persons standing up. The young, too, seemed to know that their greatest chance of safety was in lying still. The fourth method was that the parent bird was coloured to simulate the surrounding herbage, and would not move from its nest very often until forcibly pushed. The second great form of protection was by situations inaccessible to animals without wings. Those who could drive off intruders singly built solitary nests, such as the birds of prey, the larger gulls, and swans. Others, such as rooks and herons, live in colonies, and, when attacked, unite to repel the enemy. Among small passerine birds adopting this method were sand-martins, but in tropical countries the smaller class used it more extensively. The most remarkable examples were seen in the weaver-birds. Captain Drayson had given an interesting description of the habits of this class in countries infested by monkeys and snakes, which of course could climb trees. The nests were therefore so constructed that these animals could enter only from below, and only by passing along a branch which their weight would cause to dip in water, making both snake and monkey beat a speedy retreat. Although some had said that there was an architectural principle regulating the construction of birds' nests, and though similarity of structure of different groups was adduced in proof of this, Dr. M'Aldowie ventured to assert that there was no such principle involved. The similarity of structure might be explained by the fact that the habits and surroundings of most birds of the same genus are nearly alike, and their enemies almost identical. But many differed remarkably in their nest formation. The swallow family and the martin built nests of mud and clay, the sand-martin tunnelled in gravelly pits, while the swift deposited her eggs in the hole of some old tower. Here there was no architectural type. Neither would such a theory explain the facts that the wren always built its nest of material precisely the same as that which surrounded it, making it, as it were, a part of the material; that the sparrow when it built in trees erected a large-domed edifice, and when depositing its eggs in the walls of houses merely lined the bottom of the cavity with straw and feathers; and that the hawk often laid in the forsaken nests of crows and magpies. Milne-Edwards said "birds' nests which vary with the species are yet, as it were, identical as regards any species, and are uniformly constructed in the way best fitting the young of that species." In the last sentence was the key of the position; it was a law in ornithology, and demanded much attention at the hands of the naturalist. These were Dr. M'Aldowie's views, and they were the outcome of some years of study of nests and eggs in a northern district where birds of almost every class abounded. No scientific

authority that he knew of had treated the subject in a systematic manner. That some plan or design regulated the nidification of birds was certain.

SIR JOHN LUBBOCK'S "ANTS."—This indefatigable naturalist has been communicating additional papers on his insect-pets to the Linnean Society. In his two last communications, one of which was devoted to their anatomy, and the other to their habits, he stated that, instead of using water as a means of isolation, fur arranged with the hair points downwards answered the purpose better. He recommended this plan to people who live in hot countries where ants are troublesome. Sir John finds that, contrary to what has been stated, the workers (besides the queen) occasionally lay eggs, and these always produce males. Ants possess domestic servants; a curious blind beetle (*Claviger*) residing in some communities, though the ants are not all on a level of intelligence sufficient to keep clavigers. Sir John said he had two queens of *Formica fusca* five years old, and in good health, and also workers of different species, some four years in his possession. Though previously he has shown instances of ants using their friends badly, yet to their credit it may be said that ants of the same nest never quarrel or are ill-tempered among themselves. An instance was given of an ant without antennæ losing her way, and being attacked by an enemy, and afterwards tenderly relieved by a good Samaritan. From the experiments recorded, it would seem that ants recognise fellows of the same nest, but where, as in some cases, there are one hundred thousand individuals, it appears incredible that they should recognise each other at sight; nor is it likely that peculiarities pertain to those of each nest. Have they signs or pass words? Sir John Lubbock has endeavoured to throw light on this subject by experimenting on the pupæ. Although certain species of ants are deadly enemies, yet their larvæ if transferred to one another's nests, will be taken care of as if their own. In ant warfare, sex is no protection; but the young are spared. Now, if recognition were effected by signal or password, the larvæ or pupæ would not be intelligent enough to appreciate and remember this, and afterwards in being returned to the former nest, when full grown would carry the signal of the wrong nest to their detriment. The results of several experiments on *Formica fusca* and *Lasius niger* were, among others, that thirty-two ants transferred from their nests as pupæ, and again when older returned to their own nests, were all amiably received, from which Sir John infers that they have no pass words.

THE LATE MR. FREDERICK SMITH, F.L.S.—Entomologists throughout the world will hear with regret of the death of this celebrated naturalist. He was one of the assistant-keepers of the zoological department of the British Museum, and our great authority on matters appertaining to the Hymenoptera.

WHITE'S THRUSH.—Mr. Harting states in the "Zoologist," that a specimen of this rare bird was shot in September, 1878, at Hardacres in Berwickshire. Another specimen was seen in the same neighbourhood in January last.

NEW SPECIES OF CHAMELEONS.—At a recent meeting of the Zoological Society of London, a communication was read from Dr. A. Günther, F.R.S., containing a description of four new species of chameleons from Madagascar, proposed to be called *Ch. malphe*, *Ch. brevicornis*, *Ch. gularis* and *Ch. globifer*.

MOUNTING AND PRESERVING LARVÆ.—I was pleased with Mr. Brewster's method of expelling the internal tissues of caterpillars, and it may be interesting to know that the best lepidopterists in this part inflate their grubs with melted paraffin wax. This is coloured to suit the colour of the larvæ in hand, and injected with a fine male syringe. There may be some drawback in this plan, but it is, perhaps, the best remedy against change of colour.—*G. Robson, Leicester.*

MIMICRY IN BUTTERFLIES.—A paper has just been read at the Entomological Society, by Dr. F. Müller, recording a remarkable case of mimicry in the Brazilian butterfly, *Eucides pavana*, which mimics another insect called *Acraea thalia*. It is however, in the male sex of *E. pavana*, that the greatest resemblance to the *Acraea* is found.

TESTACELLA MAUGEI IN JERSEY.—IN SCIENCE-GOSSIP for July last, there appeared a short notice from me, announcing the occurrence of what was supposed to be *Testacella haliotoidea* in this island. Since that time I have found two more specimens. Having sent one of them to John Gwyn Jeffreys, Esq., the author of "British Conchology," that gentleman informs me that the species is unquestionably *Testacella Maugei*, not *Testacella haliotoidea*. I feel it right to make this correction.—*Martin M. Bull.*

THE STINGS OF BEES.—Professor Church describes in "Nature" some experiments made sixteen years ago with the poison from wasps' stings, when he found to his astonishment that it was invariably alkaline instead of acid. A living wasp, duly held in the cavity of a perforated cork, was easily induced to sting a piece of turmeric paper; when a brown-red spot immediately appeared.

"THE PLAGUE AS IT CONCERNS ENGLAND."—We advise all our readers who are interested in this momentous question to procure this well got up pamphlet, published by Hardwicke & Bogue, at one shilling. It gives an historical account of the plague, and the methods to be adopted to prevent its spread, and has been compiled from official and other sources.

BOTANY.

PYROLA, THE WINTER GREEN.—During July last I accidentally came across a small bed of the above plant near Canterbury. I showed it to several botanists, but had a difficulty in finding the name. I thought it would interest some of your readers to know it grows in Kent, and I shall be pleased to furnish any one with specimens in the coming spring who desires it.—*G. Parry, St. Paul's, Canterbury.*

TERATOLOGICAL NOTES.—The curious form in the flower of a calceolaria figured on page 41 is not uncommon, though I do not remember noticing it in the small-flowered shrubby varieties. A similar

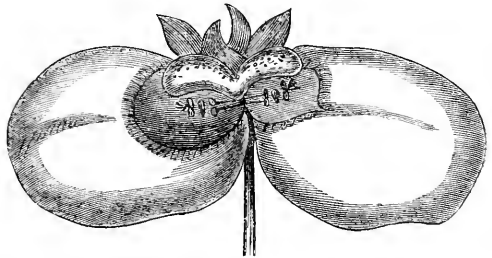


Fig. 86.—Malformation of flowers of Calceolaria.

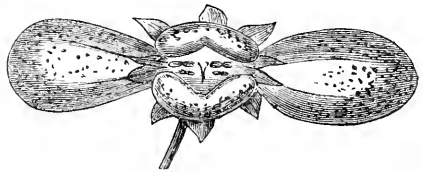


Fig. 87.—Malformation of lips of ditto.

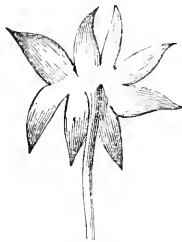


Fig. 88.—Calyx seen from behind.

flower is figured in Masters' "Vegetable Teratology," page 230, where it is described as an instance of perfect Peloria, resembling that often found in various species of Linaria, &c. The herbaceous, greenhouse calceolarias are very subject to irregular development of different kinds, and in a collection of two or three dozen a large number of curious and interesting malformations may be found. I inclose rough sketches of two flowers which I found with various other abnormal specimens last year. It will be seen that in each case two flowers have apparently coalesced, though in different manners. In fig. 86 the two flowers are nearly of normal size and form, but the two upper lips are united. In fig. 87 the lower lips are only about half the normal size, the lower pair of stamens are abortive and there is only one pistil.—*F. T. Warner, Winchester.*

GEOLOGY.

THE ROYAL DUBLIN SOCIETY.—We are much pleased to note that Mr. G. H. Kinahan, M.R.I.A., the author of the "Geology of Ireland," which we had recently the opportunity of reviewing in our pages, has been elected president of this society.

PEBBLES WITH UPPER-LUDLOW FOSSILS IN THE LOWER CARBONIFEROUS CONGLOMERATES OF NORTH WALES.—At a recent meeting of the Geological Society, a very interesting paper on the above subject was read by Aubrey Strahan, and Alfred O. Walker. The authors described the mode of occurrence near Abergele of certain lower carboniferous conglomerates, best exposed in Ffernant Dingle, and especially of one containing numerous red and green sandstone pebbles, which enclose fossils of Upper Ludlow forms, and lying above the so-called "Bastard Limestone." From the arrangement of the beds the authors believe that they may have been deposited against a bank or sloping surface of Wenlock shale; and they state that the great majority of the pebbles in the conglomerate are quite unlike any rock known in the district, but closely resemble the Upper Ludlow beds of Kendal and Central Wales. The authors discuss the origin of the pebbles, and suggest "the probable extension of the Ludlow beds under Lancashire as the most likely source from which they can have been derived."

PRESERVING FOSSILS.—Prof. W. Boyd-Dawkins in an appendix to his "Cave Hunting" gives the following directions for the preservation of remains from caves: "The fossil bones and teeth, which have very generally lost their gelatine and have a tendency to crumble and split to pieces in drying, should be gradually dried, and from time to time saturated with a weak hot solution of gelatine or glue. Silicate of soda, sometimes called "liquid glass," or melted paraffin (not the oil), may also be used for the same purpose. If the bones are extremely soft, they may be rescued from destruction by letting them dry in the matrix, saturating them and the matrix with a solution of gelatine, and then clearing off the latter." —C. R. L.

PRESERVING FOSSILS.—I always use a solution made by the Indestructible Paint Co., 27 Cannon Street, E.C. Some years ago it effectually water-proofed (so to speak) some Portland stone columns to which I applied it, making their surface as hard as flint. Hence I have used it on fossils and find that it renders even chalk perfectly hard. I recently saturated some impressions of sponges, which we all know will hardly bear touching, and find that now they might almost be brushed without injury. It is hardly necessary to add that the solution is perfectly colourless, and that it leaves not the slightest perceptible deposit. The cost is very trifling, and as the company made me for this express purpose a pint of solution for two or three shillings, I have no doubt

your correspondent could get what he wanted. He will not be disappointed.—F. H.

METHODS OF PRESERVING FOSSILS.—In SCIENCE-GOSSIP for February, a correspondent W. G., asks for information as to the best method of preserving mammalian bones and other fossils, saying that he had been advised to paint them over with a hot solution of gelatine, but had not found the result very satisfactory. In the March number, Mr. J. W. Carr recommends that they should be painted with thin gum. Mr. Carr may have succeeded with this to a certain extent, if by *painting* he really means *soaking*, for I suspect that the reason why W. G. did not succeed with the gelatine may have been that he did not soak the fossils sufficiently; if the bones were at all large and were merely painted over with a thin solution of gelatine, they certainly would not become very much harder by such a process. For the bones of the larger mammalia glue is the best material; it should be prepared in a vessel which is large enough to admit the specimen, which should be lowered into it on a sieve or a piece of perforated wire, and allowed to remain in the solution for a few minutes, till it has imbibed a sufficient amount of glue to replace the lost animal matter, it may then be carefully taken out and left to dry. If the bone is a perfect one, with epiphyses, &c., the operation may have to be repeated, and it is a good plan to remove a small portion of the surface bone so as to admit the solution freely into the interior; when the specimen is taken out, the fragment of bone can be carefully replaced. For all the smaller bones and for mollusca extracted from sands or loams, gelatine is preferable; like the glue it should be used while hot and in the manner above described; or it may be ladled over the fossil if it is very delicate and tender. A thin solution of gum-arabic or gum tragacanth is useful for painting over the surface of fossils from the lias or coal measures to prevent their scaling or chipping. As regards chalk fossils my experience is that those from inland localities seldom need any preservative process, but that those collected from sea cliffs, being saturated with salt water, generally effloresce and split up, unless they have been well soaked in fresh water. As soon as they are brought home they should be put in a basin of fresh water and left there for a day or two; then they may be taken out, trimmed and cleaned, and replaced in clean fresh water, where they should remain for three or four weeks, the water being changed at least once every week. I have always found this plan effectual. In the "Geological Magazine," vol. ii. p. 239, your readers will find a short article by Mr. Davies, of the British Museum, in which instructions for preserving mammalian remains are given. Some hints on trimming, cleaning, and preserving fossils will be given in the new edition of Penning's "Field Geology," now in the press.—A. J. Fukes Browne, Highgate.

NOTES AND QUERIES.

SQUIRREL.—A few weeks ago, I saw, what at first I was inclined to call a black squirrel, more correctly I should say the colour was a very dark sable, it had the usual white breast; I have heard of a so-called "yellow squirrel," but never one of this colour. I had a good view of the animal, which crossed the road about thirty yards in front of me.—*W. G. Tuxford.*

TENACITY OF LIFE IN THE WASP.—Being engaged in a drawing office connected with the Great Western Railway in 1841, we were very much pestered by wasps, attracted by some lime-trees then in blossom outside, to the extent that one hundred were killed during a single day. One of these individuals I dispatched while crawling over my board, by dividing the abdomen from the thorax with my pen-knife. Seeing him buzzing about very actively, and trying to fly, but unable to do so, being out of balance, it occurred to me to make him a paper tail; the first I made about the length of his own was not heavy enough, being of very thin paper, so I made one three-quarters of an inch long, in shape like that of the large Red Ichneumon fly. This I attached to the thorax, for want of better cement, with a piece of prepared ox-gall; immediately he took wing and flew about the room, apparently greatly to the terror and annoyance of the other wasp, who attacked him fiercely, apparently both by wing and sting, the latter of course of no effect on his paper appendage. He flew about for over two hours, when I lost him, and therefore cannot tell you how long he continued active; he probably flew out at the open window.—*F. L., Rotherham.*

YEW-TREES IN CHURCHYARDS.—Your correspondent, E. Straker, makes inquiry for any traditions or reasons why yew-trees were planted in churchyards. A learned antiquarian once provided me with information as follows: "An act of parliament passed in the reign of an early English monarch, made the planting of a yew-tree in every parish churchyard compulsory. Cross bows were made of this material; yew wood became scarce, and the God's acre seemed a suitable spot for the cultivation of such a necessary material for the warlike requirements of that period."—*H. P. Stock, Barnet.*

YEW-TREES IN CHURCHYARDS.—In the churchyards of Northamptonshire and neighbouring counties fine old yew-trees may still occasionally be found, and invariably, as far as my experience goes, on the south side of the church. I have noticed that where this occurs the most used entrance to the church is also on the south, the north door in most country churches having been blocked up to keep out the cold. The trees being ornamental as well as useful were probably planted where they would be most seen. For the same reason the south-side was chosen for burials, so that the congregation, coming to and leaving their parish church, might see the graves, and be reminded to pray for souls of departed friends.—*W. H. Jones.*

YEW-TREES IN CHURCHYARDS.—It may interest E. Straker to learn that Sir Thomas Brown, in his "Urn Burial," thinks it possible that the planting of yews in churchyards arose from ancient funeral rites, or as an emblem of the resurrection, from its perpetual verdure. The yew-tree was an emblem of mourning with the Egyptians, Greeks, and Romans, from whom it was adopted in turn by the Britons. It appears also to have been an ancient custom to place them singly. Statius in his "Thebaid" calls it "the

solitary yew;" and it was at one time as common in the churchyards of Italy as it is now in North and South Wales. I have heard that in many Welsh villages the yew-tree and the church are exactly the same age, the one being planted when the other was built. Another supposition is that yews were planted to protect the church from storms. In statute 35 of Edward I. it is stated that trees were often planted to defend the church from high winds, and the clergy were requested to cut them down for the repairs of the chancel of the church whenever required. A great deal has been said about yew-trees being planted to supply bows, but is there really any record of this?—*G. O. Howell, Shooters' Hill.*

INTELLIGENCE IN MAN AND ANIMALS.—Man judges according to his capacity of the actions of his fellow-men, by inferences drawn from a knowledge of his own nature. The truth of this may be seen in the case of a man born blind, who cannot possibly be made to understand what the sense of sight is. In judging of the actions of the lower animals, whose nature obviously differs from his own, he has not the same means of comparison, and is liable to err, if in actions which resemble his own, he rashly assumes they are the result of reason. Those who credit the lower animals with reason, if they are consistent, will also credit them with conscience. This Mr. Darwin does (see "Descent of Man," part i., chap. iii., p. 78). "I agree with Agassiz, that dogs possess something very like a conscience." In the same work Mr. Darwin draws the usual distinction between instinct and reason, and at p. 38, part i. says, "We may easily underrate the mental powers of the higher animals, and especially of man, when we compare their actions founded on the memory of past events, on foresight, reason, and imagination, with exactly similar actions performed by the lower animals; in the latter case the capacity of performing such actions having been gained, step by step through the variability of the mental organs and natural selection without any conscious intelligence on the part of the animal during each successive generation." Leave out the words higher animal, and the observation is the same in effect as that in my letter of January 1. The whole gist of Mr. Darwin's work, however, is to prove that the intelligence of quadrupeds differs from that of man only in degree. The point of agreement which exists owing to their possession of the same senses as man, are strongly insisted on, the points of difference much less so. Mr. Darwin thinks (see "Origin of Species") that the love of man may have become instinctive in the dog, which seems highly probable, and explains many of the actions in which observers think they have discovered a guiding power of reason. In the concluding chapter of the "Descent of Man," Mr. Darwin describes the natural feeling of abhorrence with which he first saw the savage of Tierra del Fuego, and compares them unfavourably with a monkey. Low as these savages may be in the human scale they have learned to barter (see Mrs. Brassey's "Voyage of the 'Sunbeam,'" and may yet prove capable of systematic fraud. Take from man his reasoning power, latent though it may be in many cases, yet underlying all his conceptions, and we find the idiot who would perish but for extraneous aid. Take from the quadruped the modicum of reason, which Mr. Darwin and others of his school attribute to it, and we have an animal endowed with the same kind of intelligence we do not understand, but name instinct. In conclusion, I would point out to Mr. P. Q. Keegan, that the metaphysical dispute respecting the "precise nature or manner of the reasoning powers," which he concisely epitomises does not affect the question:

Does the intelligence of animals differ from that of man not only in degree but in kind? which may be affirmed or negated whichever school of metaphysics the writer belongs to.—*H. Barclay.*

INTELLIGENCE IN MAN AND ANIMALS.—With respect to this subject, a remarkable instance is mentioned in "Nature," February 20. Some rats gnawed through leaden pipes to obtain water. Dr. Darwin explained by saying that rats heard the water trickling, and reasoned about it. They cut through the pipe to obtain it. I think this explanation probable. I agree with your correspondent, Mr. Rogers, who contends that memory is an act of reasoning. Dr. Darwin had a dog which recognised him after several years' absence. This is mentioned in his "Descent of Man," chap. ii., I believe, but I quote from memory. This dog must have exercised some reasoning power in recognising Dr. Darwin. With respect to reason being developed instinct, as Mr. Keegan says, Huber thinks that in the lower animals there are glimpses of reason, not merely instinct. Darwin says that instinct is variable, and it might vary so far as to produce some reasoning faculty. With respect to man's reason, some Evolutionists argue that it may not have been merely developed, but that some supernatural change may have taken place. Henslow in his "Evolution and Religion," writes to this effect: Certainly the gap between the apes and man, in respect to cranial capacity is very great, and not easily bridged over. Lopinard (*L'Anthropologie*) gives 1500 cubic centimetres, as cranial capacity of man; 531 for gorilla. Making allowance for size of body, the ratio of brains of chimpanzee and man is given as 38 to 100. The fact of monkeys chattering, apparently consulting, and then simultaneously acting, is not, I think, explainable merely by instinct. The reasoning might not be very acute, but that would not be necessary. Of course much depends on the way the facts are looked at. Those favouring the view of animal reasoning, would naturally find arguments where their opponents would question the reasoning power. Our natural habit of regarding ourselves as the most perfect beings, also militates against the view of animals having reason, as we are naturally loth to allow that they are of similar nature to ourselves. But on the whole, I think that animals have a somewhat higher faculty than mere instinct, and therefore some reasoning power.—*A. Wheatley.*

INTELLIGENCE IN MAN AND ANIMALS.—As a small contribution to the consideration of the above-named subject, permit me to refer to a fact which I recorded in a paper that appeared in *SCIENCE-GOSSIP* for November 1, 1876, entitled "Spiders and their Webs." The particular spider there mentioned, after being bitten by a smaller spider of another species, plucked the poisoned limb out of the socket, and cast it from it, evidently, to save its life. Now, was this conduct prompted by what we call reason, or by what we call instinct? Further, what is reason and what is instinct, more than names under which we cloak mysteries, that we are all very far from comprehending? The voluntary act of this spider in amputating its own poisoned limb, could scarcely be attributed to "memory," or "experience," and it suggests some deep reflections. Was it conscious, for instance, that death would ensue, unless the poisoned limb were immediately plucked out and cast away? and, if so, does this show a knowledge of physical right and wrong? Again, was this small creature acquainted with Harvey's great discovery, "the circulation of the blood," and did it know that an injected poison could be absorbed into the circula-

tion to the destruction of life? Further, did it know that in its case, Nature (or, for anything we know, itself) could reproduce the amputated limb? And, lastly, who had been sent to its peculiar mental world, to preach the Divine precept, "If thy right hand offend thee, cut it off, and cast it from thee?" Man is too apt to arrogate to himself a peculiar or special niche in the great temple of nature, and to rely, too confidently, upon his own very finite powers of observation. Before the telescope was invented, the infinitude of the stellar system was, "the sun and moon and eleven stars;" before the microscope was invented, a drop of water was a drop of water, and nothing more; and should it ever be practicable to make telescopes or microscopes that could increase our mental vision as greatly as these instruments have increased our physical vision, then we might be in a better position to pierce the depth of the mystery that attaches to the reasoning powers of the lower animals. It is generally asserted that, so far, "man is the greatest outcome of creative power;" but as we have only man's word for this, there may be more self-conceit than infinite truth in the assertion. The larvæ of the blow-fly, when it is devouring the flesh of a living animal, may conclude that they are the greatest outcome of creative power, because they are unable to comprehend any higher outcome of this power; but we know this would be a mistaken conclusion on their part; and for anything we know, the earth, planets, sun and stars, may all be living, and intelligent, outcomes of creative power, as much superior to man, as man is to the blow-fly. And as regards reason, why may it not be the universal concomitant of all created being? Scientifically as well as poetically, we may conclude, that the Creator will be reflected in all His works; and if so, His attributes may be expected to be reflected by all His creatures to the finite extent of the reflecting capacity which has severally been bestowed upon them. Man, consequently, may be in error, when he assumes that he, alone, is the possessor of reasoning powers.—*C. L. W.*

INTELLIGENCE IN MAN AND ANIMALS.—I have read with pleasure the notes of your correspondents on this interesting subject, and, although it has been ably dealt with by Messrs. Keegan and Barclay, I hope still to see a little more light thrown on the matter, and a more intelligible distinction shown between instinct and reason. Mr. Rogers, in your February number, says: "A little personal observation and reflection, would, I should have thought, suggest to your correspondent, &c., that what is called *instinct* in animals often passes under the name of *reason* in man." Now "personal observation and reflection" has convinced me, whether I am right or wrong, that anything done by instinct is done without reason, although the instinct which prompted the action might have been, as Pope says, an "unerring guide." The words *instinct* and *reason* to me convey a very wide and different meaning. Animals, I believe, act by instinct, and man has had the higher power of reason given him upon which to act, and the only quality in man which I can compare to instinct is impulse. That acting by instinct and acting by reason are from two different causes, I think there is ample evidence, although the action may be the same.

Pope says:

"Reason raise o'er instinct as you can
In this 'tis God directs, in that 'tis man"

Mrs. Hale says:

"The meaner creatures never feel control,
By glowing instinct guided to the goal."

With regard to Mr. Rogers's remark that the "difference which exists is chiefly one of development," I do not agree. I cannot comprehend "developing instinct," and the sentence seems contradictory in itself. The same question arose at a Debating Society, to which I belong, on a discussion "Is conscience a true guide?" when the apparent consciousness of wrong-doing in dogs was argued in support of the affirmative. Mr. Keegan has, I think, explained this, and the fact of dogs being endowed with sufficient instinct to know that which gives them pain, is not sufficient to convince me that the knowledge is the result of reasoning.—*Idea*.

INTELLIGENCE IN MAN AND ANIMALS.—The following anecdote which came under my own observation some years ago is a curious instance of memory and reasoning in a cow, and can hardly be relegated to mere instinct. My father had sold a cow, which we had reared, to a neighbouring farmer, who kept her three years and then sold her to a miller four miles farther from our homestead. She was with the miller three years, having been absent from us six years, and never in the interim having visited the spot; but she had not forgotten its comforts, especially the scalded mashies of bran and pollard mixed with home-brewed ale that were provided for her at the birth of her calves. One winter day (January 12) when she was about to calve, her master had to leave home, and put her in charge of his man, who forgot her. At night she was looked for in vain. She had at last found her opportunity and escaped to flee to her old beloved home, and actually reached our orchard fence, when she could get no farther, and there her calf was born, and she had the satisfaction after all her trials of being nursed in her old cow-house.—*S. Martin*.

POSITION OF THE MOUTH IN SHARKS.—The peculiar position of the mouth in the sharks and some of their allies, used to be a frequent theme of comment among naturalists of the old school. It was pointed out as nothing less than a special arrangement to enable a destined victim to escape, while the shark was turning on one side to bite. In other words it was plainly seen to be a structural feature disadvantageous to the species in which it occurs. Singularly enough, I have seen no reference to this anomaly in any work, either advocating or combating the Darwinian hypothesis. It seems to me very difficult, if not incapable of explanation on the view of natural selection. If the position of the mouth which prevails in most fishes be the original one, it would seem that any variation from such position must be disadvantageous to the individual, and would militate powerfully against its survival. Or if, on the other hand, the original position of the fish-mouth was that which it now occupies in sharks, I fail to see why any variation which tended to bring it forwards, should not have easily and completely superseded the primitive type among sharks, &c., as well as among other fishes.—*C. R. Slater*.

EGYPTIAN GOOSE.—"The Shepton Mallet Journal" announces that Mr. Padfield, of Pecking Mills, Evercreech, shot an Egyptian wild goose of beautiful plumage, and weighing about 4½ lb., near his mill-pond, on February 27. There were two in company; the other succeeded in making its escape, although wounded.—*W. Macmillan, Castle Cary, Somerset*.

QUERY AS TO FLOWER.—Can any of your readers, kindly inform me, what flower Shakspeare refers to

in the closing stanzas of "Venus and Adonis"? where he says—

"A purple flower sprung up, chequer'd with white,"

and ends his reference thus:

"There shall not be one minute in an hour,
Wherein I will not kiss my sweet love's flower."

J. W. Wheldon, Jun.

THE CUCKOO'S EGGS.—Having read in a previous number some questions and remarks on the cuckoo and its eggs, I thought I would give my experience of that bird. I have frequently found the eggs and young, but never in a nest built on the ground, in which some say they are most often found. In some works on ornithology it is said that eggs are frequently laid in wrens' nests; but surely that is a mistake, as the young cuckoo would certainly be too large for such a home. Those I have found were generally either in robins' or hedge-sparrows' nests, and once I found an egg in a half-built chaffinch's. On no occasion have I found nor heard of more than one egg in the chosen nest. How strange it is, that the maternal instinct of birds should be unable to distinguish between their own nestlings and the awkward and big young of the cuckoo! Some time ago I found the young of the latter bird in a robin's nest, and as I wished, if possible, to keep it, I put it in a large cage out-of-doors. It refused all nourishment, and struggled fiercely when food was forced on it. One day I was sitting a short distance from the cage, when I saw a robin fly right up to the bars, and give some food to the cuckoo, which received its, presumably, foster-mother, with a deal of fluttering and apparent joy. For several days two robins fed him regularly, but after a time they discontinued their visits, and in spite of all my efforts the bird died. It seems very curious that the robin-parent should have found out and fed the cuckoo for so long a time, especially as the bird was brought from a long distance to my home.—*Junior*.

ON THE DEVELOPMENT OF THE HOUSE-FLY AND ITS PARASITE.—If Mr. Holmes will again glance over this paper, he will see that I had not the subject of the sketches under observation at all, but that these "were made by Mr. G. Harkus from the microscope, with the aid of a Beale's reflector," and that the size of the egg as given by him is there stated to be $\frac{1}{30}$ inch in diameter, while that of the maggot on emergence was $\frac{1}{2}$ inch. The discrepancy noted may have arisen from the reduction of the original drawings in engraving. It appeared to me that while the egg and larva shown by Mr. Harkus were identical with those matured in my experiment, the chrysalis and fly were, as I stated, "undersized and impoverished;" this I attributed to want of sufficient nourishment while in the larval stage, the extraordinary part of this matter being the wonderful rapidity of the insect's metamorphosis. I cannot agree with Mr. Holmes "that *Musca domestica* never lays its eggs on meat," much stranger places of deposition have been noted, amongst snuff, for instance, the ammoniacal odour being the probable inducement; while, on the other hand, according to Cuvier, *Musca vomitoria* sometimes selects a plant for the purpose, "deceived by the cadaverous odour arising from *Arum Dracunculoides* when in flower, it also leaves its eggs there." If Mr. Harkus can recover the subject from which the sketches were made, and which he thinks is preserved, I will pass it through for the editor's determination.—*M. H. Robson*.

VENTRILLOQUISM IN BIRDS.—In a former SCIENCE-GOSSIP of last year is a paper about "Ventriloquism in Birds" which solicited the experience of the same. While paying a visit to a station in Westland or Kakitika (Middle Island, New Zealand), in 1876, while walking in the bush I heard a very sharp clear note, and my host informed me it was the "ventriloquist bird," of which I had often heard, and asked me to look for it. I did so, but wherever I went the voice seemed to be at one side or behind me, till by chance I disturbed the bird, when it flew off before I could see it plainly. From what I could gather it resembles much in appearance the English blackbird; is often heard and seldom seen, owing to its natural shyness and peculiar habit of disguising its voice. This was in the centre of the Southern Alps, just below the line of perpetual snow, and during the autumn of our year.—*W. E. Barker, Jesus College, Cambridge.*

THE MOA.—On page 40 of No. 170 SCIENCE-GOSSIP, February 1, 1879 is an article "The Moa not yet Extinct (?)" The bird is said to have been seen in the "province of Nelson, near lake Rotorua and Cannibal Gorges," the latter I have not heard of nor can I find them on the map. The only lake of that name is in the province of Auckland (North Island) latitude $38^{\circ}10'$ south, longitude $176^{\circ}17'$ east. I fancy it must be a hoax, as nearly every year false reports are spread of them having been seen, very often turning out to be tame emus, escaped into the bush. Also, as yet very few bones, only two or three I believe, have ever been found in the North Island, while in the Middle Island we plough them up wherever new ground is broken up. The only lakes in Nelson (Middle Island) are lakes Pakerua, Brunner, Hochstetter, and Hawick. So I think there must be some mistake.—*W. E. Barker, Jesus College, Cambridge.*

CATERPILLARS AND ONION-CROPS.—For several years past the onion-crops in this neighbourhood have suffered severely from the ravages of the caterpillars and some insect. Can any of your readers suggest a remedy?—*P., Haslemere.*

LONDON UNIVERSITY, FIRST B.A. PASS EXAMINATION.—Can any of the readers of SCIENCE-GOSSIP inform me what are the best works to read on the following subjects as required in the above examination—algebra, geometry plane and solid, trigonometry, mensuration, and co-ordinate geometry? The information would doubtless be useful to many, as the difficulty in selecting from so many works as exist on these subjects is considerable.—*W. J. B.*

THE COLOURS OF TWIGS, BRANCHES, &c.—Trees appear purplish-red during the winter, because the greater number have brown, grey, or purple twigs, and the scales covering the leaf-buds are usually of the same, or some brighter and warmer colour. I believe that this will be found to be the case with our principal trees, the oak, birch, elm, beech, alder, and willow. The oak-twigs are occasionally grey, but generally the same colour as the buds, which, as far as I know, are always brown. The ash has grey stems and black buds. The smaller trees and shrubs are often very richly coloured; the cornel justifies its specific name by its blood coloured twigs; the members of the Rosaceæ are red, orange, and purple, in thorn, bud, and leaf, with much grey on the bark of some species, as the dog-rose and black-thorn. In speaking of leaves, I refer to the blackberry, which retains its foliage in many places till the spring, but the leaves are nearly always bronzed-like veterans. The stems of the blackberry are also very purple in hue.

The various willows bear purple branches, and often very brilliantly tinted buds. The colours enumerated are not of course perfectly pure; they are shades of every degree, from orange or crimson in the willow-buds just noticed, to dull brown or purplish grey. The reason for mentioning so many instances is to prove that the local colour of the masses of branchlets is purple or brown, and to show that the colours of the various twigs, buds, and thorns are such as would produce a purplish-red or russet effect when massed together, and crossed in every direction as they always are. It was the practice, we know, of many great colonists, to get a tint by "hatching and driving together loosely," a number of different harmonies, which give, by that means, a colour which could not have been formed so well in any other way. This is the method of Nature. The variously tinted branchlets, their light and shade, with the bluish haze of the atmosphere, combined, will account, in my opinion, for the hue of trees and shrubs during the winter months.—*M. Snape.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

W. MARTIN.—Get Stark's "British Mosses," with coloured plates, published by Routledge & Co., at 7s. 6d.

W. A. WATTS (Manchester).—Your fossils are the univalve, *Linnea longiscata*, from Eocene strata; the bivalve, a Brachiopod, *Producta striata*, Carb. Limestone.

C. MCINTOSH.—Inquires the best method of mounting butterflies' eggs for the microscope. Perhaps some of our readers will answer him.

B. B. SCOTT.—See article on "How to Prepare Skeleton Leaves," in vol. of SCIENCE-GOSSIP for 1872.

W. H. LITTLETON (Bristol).—The best and cheapest book on British Coleoptera, is Rye's "British Beetles" (coloured illustrations), published by Routledge, at 2s. 6d.

W. H. NEWBERRY.—It is not at all uncommon to see specimens of peacocks, tortoise-shell, and one or two other species of butterfly, which lie up or hibernate during the winter, coming forth on warm days in February and March, having been stimulated into activity by the warmth.

T. WORKMAN.—Ask for the British Museum Catalogues of the insects you mention.

GEORGE TURVILL.—Are you quite sure the "gigantic fleas" on the mole are not ticks (Ixodes)?

T. W. DEALY.—Press of matter has hitherto prevented the publication of your paper, which is in hand.

W. S. (Edinburgh).—You will find full and ample instructions how to proceed in staining vegetable tissues, in the late Dr. Beatty's admirable articles on "Decolouring and Staining Vegetable Tissues" in SCIENCE-GOSSIP, vol. for 1875.

B. HOBSON.—The "London Catalogue" is merely a well-verified list of indigenous British plants. You will find specific descriptions of all our British plants in Hayward's "Botanist's Pocket Book," published by Bell & Daldy, at 4s. This latter is the best book of the kind we know of.

H. CROWTHER.—The specimen labelled "greensand," undoubtedly belongs to that formation. We are not so sure of the numerous small specimens queried "gault," in the absence of characteristic fossils, although they strongly resemble "gault," still we have seen clays of other formations much like them. The red specimen labelled W. looks like altered gault, and very likely it is so, as we found remains of a small decapod crustacean in it. The reddish-coloured sandstone belongs to the lower greensand as the fragment of fossil *pecten* it contains sufficiently shows.

JAMES LOWTHER.—We dare say you will be able to get a good specimen of living Plumatella or Fredericella from Mr. Thomas Bolton, naturalists' studio, 17 Ann Street, Birmingham. He regularly supplies naturalists all over Europe every week with living organisms.

G. R. B. (Shorham).—The "seed-like objects adhering to orange-peel," are the pupa cases of *Ceratites citripedia*. Slack's "Pond Life" could very likely be obtained from W. Wesley, the natural history bookseller, 28 Essex Street, Strand.

W. H. J. (Uppingham).—The articles named will probably be continued during the summer months. Names of the species included were as follows:—*a. Scirpus carinatus* (Sm.); by Hooker made a subspecies of *S. lacustris*; we believe it to be distinct. *c. Panicum Crus-galli* (Linn.) *d.* We think this is a melilot, one not seen before, but will tell you next month. *e. Setaria viridis* (Beauv.) *f. Ononis arvensis*, (Linn.) *g. Eleocharis unguiculis* (Link.) *h. Glycyrrhiza aquatica* (Sm.) *i.* A pretty viviparous form of *Cynosurus cristatus* (L.); a valuable specimen. *Note*.—Your observation, amongst botanical notes. We wish all our correspondents would send us good specimens; yours are excellent.

W. K. (Leeds).—The seeds you so kindly send are niger seeds, so called in commerce; but they are obtained from *Guzotia oleifera*, cultivated in India chiefly for the sake of a bland oil, not unlike sesamum oil, which burns in small hand-lamps, without smoking. This product is known as ram-til oil in Mysore. We are puzzled by your other question. Do you mean the olden lentil (*Ervum Lens*, L.)? Could you let me see a small sample?

W. F. (Shaw Hall, Botanical Society, Greenfield).—We believe the specimens are *Erigeron bonariensis* and *Escallonia rubra*. H. B. (Prestbury).—The ferns are *Adiantum caudatum*, *Cheilanthes fragrans*, and *Notholaena vellea*.

D. R. B. (Picton, Eunbury, West Australia).—Only one specimen we suppose to be named came to hand. It was a pretty mounted flower, a *Thysanotus*, probably *T. profliferus*.

E. SHARPE. The example sent, was not in a good state for examination. Try *Dysorhiza*.

W. H. J. (Uppingham).—The plant labelled *d*, is *Medicago falcata*.

K. A. B. (Glasgow).—Pardon our overlooking the specimens so long. They are as follows:—No. 1. *Equisetum latimacra*; No. 2. *Hieracium vulgatum*; No. 3. *Brya media*; No. 4. *Poa alpina*; No. 5. *A. viviparous* specimen, probably *Poa sp.*

EXCHANGES.

WANTED, the following dried grasses for Herbarium, the numbers in the London Catalogue (7th edition) are 1485, 1486, 1487, 1563, 1575. A list of duplicate grasses and plants would be sent to select from for exchange.—G. Garrett, Harland House, Wherstead Road, Ipswich.

ABOUT TWENTY specimens of *Helix Pisana*, from Tenby, in exchange for a few chalk or other fossils.—Rev. K. Deakin, Almondsbury, Gloucestershire.

SCIENCE-GOSSIP for 1875, 1876, unbound, having duplicates will exchange for a good Coddington or Stanhope lens.—Jas. Thompson, Mersy Mills, Hadfield, near Manchester.

WANTED, a vase, or any example of ancient British pottery; large or small, from a tumulus, earth-work or other position; or a Romano or Roman-British pot. Will give in exchange a good collection of correctly-named lichens from the Scottish mountains, or a collection of well-mounted and named slides of microscopic fungi for the microscope.—Worthington G. Smith, 15 Mildmay Grove, London.

WANTED, Menge's Preuss. Spinnen, Thorell's "Remarks on Synonyms of European Spiders," or Walckenaer et Gervais, Hist. Natur. des Aptères.—Thos. Workman, Belfast.

WELL-MOUNTED micro slides, in exchange for slide-blown eggs, works on ornithology, or bound volumes of SCIENCE-GOSSIP.—Laing, 71 Shobnall Street, Burton-on-Trent.

WANTED, spawn of natterjack toad for *Nitella translucens*, or select from Mr. Bolton's list.—M. H. Robson, 18 Albion Place, Newcastle-upon-Tyne.

WANTED, fossils, in exchange for fossils from Rhætic, Inf. Oolite, Dundry, Red Crag.—Rev. H. E. Capel, Great Eastern Rectory, Dunmow.

MOUNTED slides of Foraminifera, &c., and good material, for rare British and foreign shells, or offers. Lists exchanged.—E. R. F., 82 Abbey Street, Faversham.

AUTHENTICATED, slide-blown eggs: lumaeger, levant sparrow-hawk, lanner, saker, Greenland, Iceland, jer, eleonora falcons, golden, spotted, booted, imperial, tawny, bonellis eagles, and 500 other species offered in exchange. Specially wanted, swallow-tail, kite.—Sissons, Sharrow, Sheffield.

H. pygmaea, *H. rufestris*, *H. lapidea*, *L. glaber*, *L. fulvus*, *C. tridens*, *C. minimum*, in exchange for Succineæ or Clausiliæ, except *rugosa*.—George Taylor, Mold, North Wales.

WANTED, a small portion of glass-rope sponge, "*Hyalonema mirabile*." Good micro slides given in exchange.—Albert Firth, Ballymurphy, Belfast.

DUPLICATES of any of the following British land and fresh-water shells offered, and localities recorded where found. *Succinea oblonga*, *Lim. involuta*, *Lim. Burnetti*, *Pupa ringens*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, *V. moulinsiana*. Desiderata, numerous foreign land, fresh-water and marine shells, as well as many of the varieties of our British land and fresh-water shells, such as Linnæaceæ, Planorbis, Succineæ, and Physa.—W. Sutton, High Claremont, Newcastle-upon-Tyne.

FLOWERS of *Sparmannia Africana* for other microscopic objects, or Zoophytes, Australian Zoophytes for others. Foreign correspondence wanted.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

HAIR of English bat, unmounted, for unmounted parasite or weevil.—C. Bradley, Oxford Street, Marlborough.

SYNAPTA from Belfast harbour, and skin of eel from Lough Neagh, with other objects mounted and unmounted, for good slides; send lists.—W. Gray, Mount Charles, Belfast.

"BIBLIOTHECA HISTORICA, NATURALIS," "Bibliotheca Medico-Chirurgica," and "Anatomico-Physiologica," Leipzig, half calf, new in exchange for sea-weeds. Zoophytes (unmounted) chalk, fossils or foreign butterflies.—M. Cattrell, 53 Berwick Street, Liverpool.

WISH to exchange Hooker's "Student's Flora," for work on Zoophytes.—A. Thomson, 17 Wynne Street, Liverpool.

BRITISH birds' eggs, sixty varieties. British birds in cases, sparrow-hawk, red grouse, water-hen, green woodpecker, &c., in exchange, good micro slides.—J. R. Murdoch, Horsforth, near Leeds.

GOSSE's "Omphalos," "Vestiges of the Natural History of Creation," W. Phillips; "Mineralogy," Heath's "Fern Paradise," M. Plou's "Rambles in Search of Flowerless Plants," all in good condition. Exchange British or foreign mosses, lichens, or good micro slides.—J. R. Murdoch, Horsforth, near Leeds.

WANTED, foreign land shells, chiefly Asiatic Clausiliæ, and Philippine species, offered many shells, British and foreign, in exchange. Address, Miss F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

FINE slides of decolorised and stained leaves, showing crystals, hairs, stomates; also picked diatoms from Bermuda deposits, and others; offered in exchange for good material, only, such as diatomaceous gatherings, fresh-water algae, zoophytes, desmids, &c. Send lists to J. Temper, 12 Cecil Street, Manchester.

FOR well-finished slides of *Xenodochus carbonarius*, *Puccinia Adoxæ*, *P. Betonica*, *Ustilago longissima*, hairs of mouse, or living *Hydra viridissima*, send good named slides (physiological preferred) to William West, 15 Horton Lane, Bradford.

SECTIONS of the following woods, in exchange for microscopic slides or shells. 1. Palm; 2. Robinia pseudo-acacia; 3. Barr wood; 4. Partridge wood; 5. Satin wood; 6. Pollard oak; 7. Walnut; 8. Iron wood; 9. Bay wood; 10. Queen wood; 11. Rio rosewood; 12. Zebra wood; 13. Bahama lignum vite; 14. Purple wood; 15. Turkey boxwood; 16. Crocus wood; 17. Dantzic oak; 18. Mexican lignum vite; 19. Mahogany.—J. J. Cotton, Aelf-don, Barnmouth.

FOR living specimens of *Mellicerta ringens*, send well-mounted slide to—George Sampson, 14 Market Place, Chesterfield.

SLIDE of calcareous plates of Holothuria for well-mounted slide.—J. B., 36 Windsor Terrace, Glasgow.

FRAGILLARIA VIRE CENS, a pure gathering, in exchange for guanos, recent material, &c.—W. M. Paterson, Loftus.

WANTED, *Hypericum dubium*, *Carex rupestris*, *Cynoglossum sylvaticum*, *Achusa officinalis*, &c., for other rare plants.—G. C. Druce, Northampton.

LONDON CATALOGUE, 7th edition. Wanted Nos. 47, 43, 44, 151, 184, 212, 235, 251, 284b, 284c, 321, 588, 590, 613, 1060, and others. Many good specimens to offer in exchange. Send lists of duplicates and desiderata to A. W. Preston, Marple Bridge, Cheshire.

BOOKS, ETC. RECEIVED.

"The Hæmatite Deposits of West Cumberland." By J. D. Kendall, F.G.S.

"North Staffordshire Naturalists' Field Club Report for 1878."

"Proceedings of the Chester Society of Natural Science," No. 2.

"Is Diphtheria Preventible?" By E. T. Blake, M.D. London: Hardwicke & Bogue.

"Midland Naturalist." March.

"Land and Water." March.

"American Quarterly Microscopical Journal." January.

"Science News." February.

"American Journal of Microscopy." January.

"Bibliography of North American Invertebrate Palæontology." By Dr. C. A. White and Professor H. A. Nicholson.

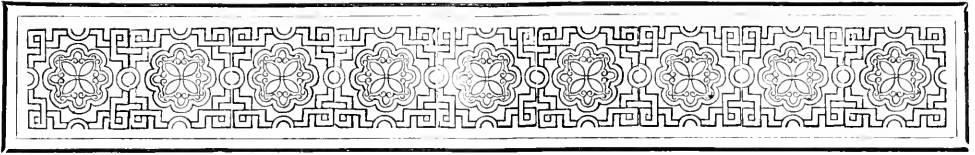
"Le Monde de la Science et de l'Industrie." February.

"Botanische Zeitung." February.

"Proceedings of the Literary and Philosophical Society of Liverpool," Vol. xxxii.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 9TH ULT. FROM:—
E. E.—M. H. R.—J. T.—W. G. S.—G. S.—S. M.—C. R. S.—
J. W. S.—W. M.—F. H.—G. G.—J. L. P.—F. J. W. O.—
J. H.—J. A. W.—G. T.—C. F. G.—L. C.—T. H. G.—C. T.—
J. W. D.—W. H. J.—G. R.—J. L.—E. R.—F. T.—R. I.—
H. B.—C. T.—W.—H. L. B.—R. H. N.—E. M.—S.—Dr. M.—
M. B.—A. F.—G. O. H.—F. M. H.—W. H. L.—M. C.—
J. R. M.—C. L.—W.—A. W.—A. T.—W. G.—W. H. N.—
C. B. C. McL.—C. R. B.—B. S.—E. M.—T. W. H.—W. M.—
I. W. Jun.—C. P.—Dr. G. A. S.—J. J. C.—W. K.—J. F. M.—
W. S.—A. J. B.—G. J. A. C.—B. H.—J. T.—W. W.—
H. M. H.—W. B. F.—W. J. E.—T. M. R.—G. S.—A. M.—
D. H.—J. B.—J. B.—J. H. W.—Dr. P. C. Q.—W. M.—
R. L.—A. W. P.—G. G. P.—G. C. D.—D. P.—&c.



THE NEW FOREST.

By E. D. MARQUAND.



ROUGHLY speaking the New Forest may be said to comprise that portion of Hampshire which lies between the Southampton Water on the east and the Avon on the west, extending from the coast line as far north as Braemore, Bramshaw, and Totton; or, in other words, the whole of the south-western corner of the county as far as the Avon. Strictly, however, the forest only

touches the sea for five miles or so near Lymington, while its western limit falls short of the river by some three or four miles. Though it includes the largest and finest tract of wild unenclosed woodland in the kingdom, there is actually within its borders less of wooded than open country. "Within equal limits," says Gilpin, in his "Forest Scenery," "perhaps few parts of England afford a greater variety of beautiful landscape than the New Forest." The northern portion consists chiefly of wild rugged woods, many presenting the same aspects and features as they did in the days of the Red King: below this is a zone of undulating moorland, breezy heaths all aglow in spring and summer with golden gorse and purple heather, with little rivulets winding and turning until lost among the emerald sphagnum and snowy cotton-grass—unfailing indicators of spongy and often dangerous bogs: and further southward we come to the cultivated district, a fair region of ploughed fields, meadows and shady lanes, dotted over with detached farms and little villages, each possessing its three proverbially necessary constituents, a church, a smithy, and an inn.

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Within this territory nature has scattered her gifts with no sparing hand; and yet, though perhaps no portion of the United Kingdom of equal area is more interesting from a naturalist's point of view, the New Forest is still to a very large extent, a *terra incognita*. Year after year it produces new insects and plants, and it is a matter of regret that, notwithstanding the number of diligent and careful observers who annually spend a few weeks or months here, so very few are willing to impart their knowledge by writing an odd paper now and then for publication in such a widely-read journal as SCIENCE-GOSSIP. Flowering plants and lepidoptera seem everywhere to have received considerably more than their share of attention—perhaps because books upon these subjects are always readily accessible; but there are other branches of entomology and botany, equally interesting, but sadly neglected from the scarceness of information about them; and if those who make special studies of these would occasionally take the trouble to pen a few dozen lines showing the most important characters of genera and species, they would confer a great boon on a large section of students to whom large and costly works or voluminous "Transactions" are beyond reach. The papers on the diptera, for instance, in the eleventh and twelfth volumes of SCIENCE-GOSSIP, are an excellent example, and the authors deserve sincere thanks for their labour; so also are the articles on diatoms, desmids, and foraminifera in the earlier volumes. Papers of this kind are of more practical value than discussions about the correct pronunciation of scientific names, or lengthy quotations from the works of tenth-century naturalists, however good these may be—and they undoubtedly are—in themselves.

If any one will look through the fourteen volumes of SCIENCE-GOSSIP in the hopes of gleaning information upon the natural history of the New Forest, he will find two or three papers on lepidoptera, perhaps a couple of very meagre ones on phanerogams, and possibly an odd note or two recording a rare capture or discovery. This is not very much certainly, so with a view of adding somewhat to the general know-

ledge of this interesting district, I have strung together a few notes from my own observations on the fauna and flora during a residence of three years in the heart of the forest; they may be suggestive, and if they possess any merit, it is that of accuracy. But it is necessary for me to state *in limine*, that I have had nothing to do with a large portion of the forest proper; my observations have been confined to an area about a dozen miles square, that is to say, from Beaulieu and Marchwood to the Avon, and from Stoney Cross to the sea, and even this is rather outside the mark, for the north-western section I have scarcely even walked through.

Among the mammalia, *ferè natura*, which inhabit the forest, the most worthy of consideration is the deer. A quarter of a century ago they were very numerous, and old inhabitants speak of it as then an ordinary thing to see a dozen or more wild deer in a walk from Brockenhurst to Lyndhurst, but about twenty years ago they were nearly all killed off owing to the injury they caused to the young trees. Now they are seldom seen, and thrice only have I come upon them in their native haunts. Foxes are more plentiful, but it is more usual to see sly Reynard with a pack of yelping hounds at his heels than to catch him *à sang froid*. An animal which is now almost extinct in the forest is the badger. I once got within sight of a singular beast which puzzled me extremely, he was neither a dog nor a cat, that was evident; but I could not get a clear view of him on account both of his distance and of the thick furze and heather which intervened. But away I went in hot pursuit: when he ran I ran, and when he stopped to look round, as he often did, I stood still; however I made but little advance on him, perhaps rather the reverse, when suddenly the animal disappeared and refused to show himself again. Some time afterwards, on describing this creature and its movements as well as the locality to a gamekeeper, the man said: "Oh it was a badger, there's no doubt—but they are very rare." Otters also are not often heard of, but their excreta may occasionally be met with near streams. A year or two ago a pair of old ones and two whelps were found in the forest by a woodman, and he, hoping to secure at least the young ones alive, hastened off for assistance, but on his return they were gone, and no one could discover their whereabouts. Squirrels of course abound, and so do moles; stoats and weasels are seldom seen alive, but a "keeper's tree" always shows a goodly number. One of the most amusing scenes I ever witnessed was a kind of serio-comic race between a stoat and a rabbit. The latter might easily have got clear away from his pursuer, but he evidently preferred running round and round within a dozen paces of where I stood and eventually succeeded in fairly tiring out the stoat. What surprised me was the utter absence of any sign of fear on the part of the rabbit—and while the stoat displayed the most bloodthirsty determina-

tion and savage ferocity, the other, it was clear, treated the whole affair as altogether a capital bit of fun, and seemed particularly pleased to find that a featherless biped was present to witness the humiliating defeat of his mortal foe.

At least three species of bats inhabit the forest: the Noctule, or Great Bat (*Vesp. noctula*), the Long-eared Bat (*Plecotus auritus*), and the Pipistrelle (*Vesp. pipistrellus*). Of the second I have seen but one example sufficiently near to identify it with certainty. Gilbert White, who gave the name *Vespertilio altivolans* to the noctule, says, "The little bat appears almost every month in the year, but I have never seen the large ones till the end of April." In this neighbourhood, where they are more numerous than at Selborne a century ago, I have seen the Great Bat on the wing on April 6th, and once as early as the 18th of March.

That the bite of the adder (*Helias verus*) is under certain circumstances fatal is probably true enough, though I know of no well-authenticated record of a thoroughly healthy person dying from its direct effects. But one thing is beyond question—its bite has very unpleasant results, sometimes even necessitating the amputation of the limb. A man here was bitten in the hand and lost the use of his arm for four months. Adders are found in these parts in considerable numbers, and in hot weather it is very imprudent to ramble about in the woods without wearing gaiters, or, failing these, the best thing is to tie the trousers tightly around the ankle; the danger being less of a bite *through* the trousers, than that the reptile in its fright may take refuge *inside* them, an occurrence which once happened to a forest keeper I know, and this so terrified him, though he shook off the brute and escaped unharmed, that he never goes into the wood now without having his understandings encased in stout leather. The dread of all creeping things extends here to the pretty little brown lizard and the slow worm, both of which are invariably cut to pieces as mortally dangerous vermin. A bright reddish-purple variety of the latter known as the "red adder" is regarded with the utmost terror, because it is supposed to be more venomous than the viper itself.

One or two words as to the birds. As might be expected their number both of species and individuals is large; a good list is given in Mr. Wise's book of the New Forest, enumerating no less than 230 out of 354 recognised British species. I am told that at present there is but a single pair of honey buzzards in the forest, and their eggs are so greedily sought after that there is but scant chance of the number increasing, except when they happen to build where the nest may be effectually protected, as was the case two years ago, when the honey buzzards built in a tall tree on a gentleman's estate, and the proprietor, with rare good sense, ordered his keepers to watch the nest day and night, and gave them strict injunctions

not to lean on the side of tenderness in dealing with would-be intruders. An osprey was shot on the coast last year. I saw it in the hands of a taxidermist at Lymington. Snipes and woodcocks remain here in small numbers throughout the year, and their eggs are found every season. Peewits breed in great numbers among the bogs. During the months of March and April the heronry at Vinney Ridge presents an animated appearance. There on the top-most branches of some of the tallest and finest beeches in the forest the herons may be seen sitting on their broad flat nests, or engaged in feeding their young. The trunks of these splendid trees are four or five feet in diameter, smooth and branchless up to a height of some twenty feet, and one would suppose the nests were inaccessible—even to the proverbial nesting boy—yet many of the eggs are taken. For this purpose large iron spikes are securely attached to the legs, and the climber makes the ascent by sticking these into the tree step by step: but it is a perilous feat, and one which requires a steady nerve and a cool head. The herons always lay twice and frequently three times in each season, beginning early: by the second week in April the young are already half grown. In May or June they leave their nesting haunts and retire to the coast. I have seen three of the woodpeckers: the green, the greater spotted, and lesser spotted, but the first is by far the most common, indeed, although the shrill squeaking laugh-like note of the two last is not an unfamiliar sound it is not often that the birds themselves are seen. Nut-hatches are pretty common and are known by the euphonious name of “mud dabbers” from their habit of plastering mud around the holes which lead to their nests. Kingfishers are scarce, and I have rarely seen two at once. Speaking of these birds, perhaps it is not generally known that they can and do procure their food from the sea as well as fresh water. I recollect observing this in Sark, one of the Channel Islands, where kingfishers are numerous, though there is not in the island a stream or (with one exception, I think) a pond big enough to sustain a minnow. More than once I have seen them among the rocks at low tide. The wryneck arrives here about the 1st or 2nd of April, and the cuckoo about the 20th. Nightingales are very plentiful, and usually begin to sing towards the middle of April. Swallows, house and sand martins arrive the second or third week in April, and swifts during the first days of May. Our latest summer visitant is the night-jar, which begins its singular churring note usually on the 16th or 17th of May; last year however I heard one as early as the 7th. These birds breed commonly on heaths, and lay their eggs—never more than two—on the bare ground. On one occasion I found a pair of night-jar's eggs as late as the 5th of August, this I noted in *SCIENCE-GOSSIP*, vol. xiii. p. 259.

(To be continued.)

SKETCH OF THE GEOLOGY OF CARDIFF AND SURROUNDING DISTRICT.

TO those interested in geological pursuits there are few localities possessing so many advantages and at the same time offering such a varied field for research, as the neighbourhood of Cardiff. Such being the case, a brief outline of the leading features of the district may not prove uninteresting to some of your readers.

The town of Cardiff is built upon the western portion of a large plain, the surface of which is not much above high-water mark, in fact, some parts of the surrounding moors are periodically covered with tidal water at the vernal and autumnal equinoxes; geologically speaking, it cannot have been long since the waters of the Severn flowed regularly over, and indeed far inland, to where Cardiff now stands. The surface soil consists of a foot or two of stiff clay, resting upon rolled blocks and pebbles brought by the action of water from the older rocks of the district; these in turn rest upon the Keuper marl of the Triassic formation.

Cardiff boasts the possession of splendid dock accommodation, and is visited by the mercantile fleets of all nations for that important article of commerce, steam coal, for which South Wales is justly famous.

The geological map of Great Britain defines a large district in the neighbourhood of Cardiff as being occupied by Old Red Sandstone deposits. This to a great extent is correct, but a careful re-survey of the district would very materially alter the boundary of this formation, and cause the introduction of a considerable tract of Silurian to be substituted. It is to be hoped these alterations will be made at no very distant period.

The Silurian deposits are well exhibited in a section on the river Rumney, about two miles from Cardiff, where a total thickness of rock exceeding 700 feet is exposed. These beds are replete with the customary fossils of the upper or Ludlow series, and at present it is a moot point whether deposits representative of the Wenlock series may not also exist here.

The only rising ground of any importance in the immediate neighbourhood of Cardiff is Pen-y-lan. This is a low hill composed entirely of Silurian deposits; a small quarry nearly at the top of the hill has furnished the writer with a typical collection of the interesting fossils of this formation. This spot will repay the visitor for the walk, as a commanding view of the British Channel, the flat and steep Holmes, the coast of Somersetshire, and the Liassic plateau of Penarth, and Leckwith can be obtained from here.

From the Silurian to the Lias represents an enormous thickness of deposits, yet, if we except the Permian and Lower Lias, the entire sequence may be obtained within a radius of about a dozen miles

from Cardiff. Caerphilly, with the ruins of its ancient castle, lies to the north of, and is distant from Cardiff about seven miles. A walk over the Rhymney Railway reveals the following section: After passing over the alluvial deposits at Cardiff, we enter a cutting through a bed of river gravels; this

is immediately followed by a cutting in the Silurian, and is the most westwardly exposure hitherto discovered in this district; it is, in fact, a prolongation of the base of Pen-y-lan referred to above. A heavy embankment occurs for about a mile, which brings us near Llanishen, where we enter a fine section of the Old Red Sandstone, consisting of conglomerate pebble beds, beds of grey and red sandstone alternating with beds of similar coloured marls; these are succeeded by the carboniferous limestone, millstone grit, and lower coal measures.

These rocks at once mark a significant change in the features of the landscape; rising to over 850 feet above sea level, they form the Caerphilly mountain, under which the Rhymney Railway is carried by a tunnel 1760 yards in length. In walking over the mountain we pass over the denuded and up-turned edges of the Old Red Sandstone, carboniferous limestone, millstone grit, and, on the northern slope, between the summit and the town of Caerphilly, twelve seams of coal, alternating with beds of sandstone and shale, crop out. About two miles further to the north, the great anticlinal axis which divides the South Wales coal basin into two unequal troughs is met with. It is composed of Pennant sandstones; these furnish good building material, and from some of the beds an excellent paving-stone is obtained. The thickness of these sandstones, as ascertained from sinkings, is over 480 feet.

The currents which brought the material for the formation of these rocks also brought large portions of the vegetation of the period, which have been well preserved in a quarry at Pwll-y-pant; some of the beds are literally crowded with such remains. When first exposed the external portion of the wood is found converted into pure coal having a cubical fracture inside, the wood has been fossilized, and an excellent idea of its structure may be obtained by preparing thin sections for microscopical examination. By far the larger portion of these remains consist of *Sigillaria*, but from the fact of *Dadoxylon antiquus*, *Pinites*, *Lepidodendron* and *Psaronius* having been discovered, a careful examination would doubtless reveal to an investigator of fossil botany many other descriptions of the flora of the coal age.

That these remains have been subjected to considerable attrition is indicated by the ends of each piece of wood terminating in a blunt point, while not unfrequently patches of fossilised vegetable matter may be found. These are undoubtedly the comminuted fragments worn from the stems and branches during the turbulent state of the water, and held in suspension until it became more tranquil, when they were finally deposited in the slight inequalities of the sea bottom.

The general arrangement of the beds in this section is briefly as follows: when the Silurian is first met with the dip is about 23 degrees to the N.E. The embankment referred to occupies a depression where the beds

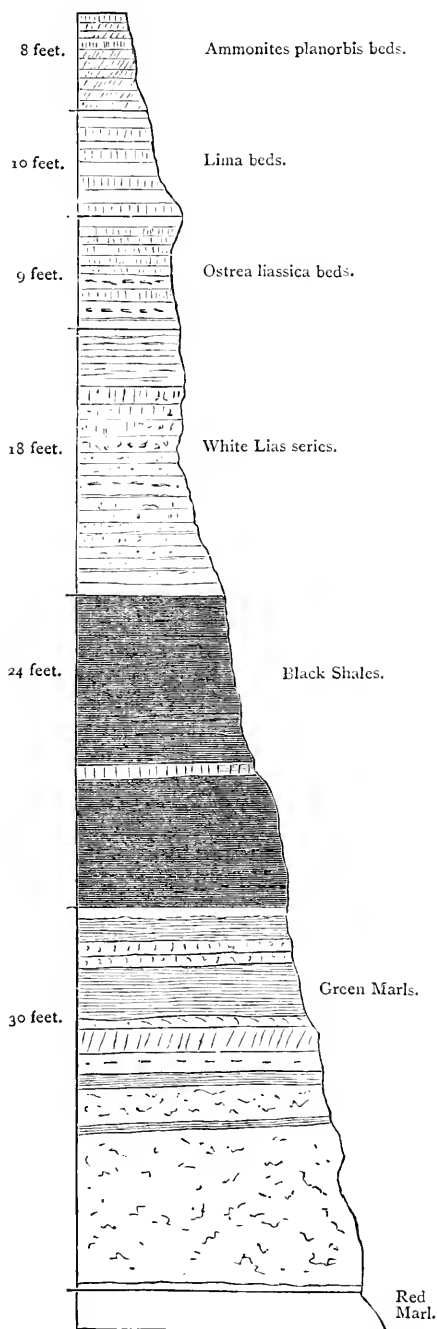


Fig. 89.—Section of Rhætic beds at Penarth.

become horizontal; at Llanishen the dip is about 22 degrees to the S.W., gradually increasing in angle of dip as the tunnel is approached, where the beds are seen to fold over an anticlinal axis and again dip to the N.E. at an angle of 33 degrees.

A trip by the steam ferry, occupying about ten minutes, lands you at Penarth, where one of the best sections of the Rhætic series in this country is exposed in the cliff. Penarth Head, about 160 feet high, contains the following series of beds. The base consists of red and pale green marls, enclosing large lenticular masses of gypsum. Beds of impure limestone succeed—the surface of one of these beds presents a very uneven

ing the site of the coast line of the Triassic Sea, it consists of angular, subangular, and water-worn blocks of the older rocks of the districts cemented in a matrix of a rich red colour; the stone can be wrought in blocks of almost any dimensions, and is much used when substantial masonry is required. Hitherto it has not furnished the writer with any fossils other than those found in the contained blocks of older rocks.

The amount of denudation which has taken place in this district is enormous. Abundant evidence remains to convince any one the coal strata must have been continuous from South Wales to the Bristol and



Fig. 90.—Section from Cardiff to Caerphilly. 1. Coal measures; 2. Millstone grit; 3. Carboniferous limestone; 4. Old Red Sandstone; 5. Silurian; 6. Gravels; 7. Trias.

surface when exposed, in the depressions of which large quantities of fish remains occur, consisting of teeth, spines, and scales of various species, prominently among which may be mentioned *Nemacanthus filifer*, *N. monilifer*, *Hybodus reticulatus*, *Acrodus minimus*, *Sargodon Tomicus*, *Gyrolepis Alberti*, *Saurichthys apicalis*, and *S. acuminatus*. Then follow a series of black shales, with occasional beds of impure limestone but exceedingly fossiliferous, containing *Axinus*, *Pullastra*, *Pecten Valoniensis*, *Cardium Rhæticum*, *Avicula contorta*, *Myophoria postera*, *Gervillia*, &c. These beds are succeeded by the White Lias series, commencing with sandy shales, passing into beds of limestone containing *Lima præcursor*, *Modiola minima*, *Anatina Suessi*, and still ascending we met with the *Ostrea* beds containing *Ostrea liassica*, *Plicatula*, Lima shales, with *Lima præcursor*, and lastly the Ammonites Planorbis beds with the fossil giving them their title. Reptilian bones are not unfrequently met with, consisting of *Ichthyosaurus*, *Plesiosaurus*, &c.

Following the cliff along to Lavernock, about two miles in a southwardly direction, the various beds may be examined in detail, as their undulations bring them within easy reach for observing more minutely.

At Lavernock the coast suddenly trends to the west and a very fine exposure of the Lias opens up. The beach from low water to the base of the cliff is covered with some of the beds, the natural fracture of which gives the beach the appearance of having been artificially paved. From this point the flat and steep Holmes (two islands of carboniferous limestone) are prominent objects standing off in the channel about three or four miles from the mainland.

At Radyr and at the junction of the Penarth line with the Taff Vale Railway near Llandaff, excellent exposures of the dolomitic conglomerate occur, mark-

Somerset coal-field, as also the underlying Old Red Sandstone. The vertical thickness of these rocks added to those exposed in the cliffs from Penarth to Southern-down amounts to between one and two miles, a mass of rock which only a corresponding immensity of time would be sufficient to remove.

W. H. HARRIS.

THE PREPARATION OF INSECTS FOR MICROSCOPICAL EXAMINATION.

By H. M. J. UNDERHILL.

THERE is a great deal of literature on the subject of "microscopical mounting," and I hesitated much before I decided to contribute yet another paper to the amount. Notwithstanding, I believe that the particular branch of "mounting" of which this article treats, is but imperfectly understood. When I was a member of the Postal Microscopical Society, I used to see the slides of some hundred and twenty microscopists, among which were a great many of what the club calls "professional slides." It seemed to me that the majority of the entomological specimens, both those by "amateurs" and "professionals" were badly set up, and that, with a few agreeable exceptions, even those which might be called good slides were mounted upon principles radically faulty. This being a fairly large circle from which to judge, I suppose that most entomologists who use a microscope set up their preparations after the same fashion, and therefore I have written a paper on a well-worn theme.

A man commencing the study of insect-anatomy reads a few "hints on mounting" in some book; the

remarks treat of mounting in general, and the beginner applies to insects methods suitable to histological, vegetable, or mineral objects. His principles are at fault, and his productions are more or less failures. This paper is not about mounting in general, and, although many of the methods detailed may be good for other classes of objects, it is only for the preparation of insects and similar things that they are here recommended.

In preparing any object, one's aim should be to obtain an absolutely correct idea of it. One should therefore endeavour firstly to set it up in a natural manner and position, and secondly to display every detail. It is always to be borne in mind that details shown by distortion give an incorrect idea of the object, and that the knowledge thus gained being inaccurate, is therefore nearly useless.

By the ordinary method of preparing insects, everything is sacrificed to the display of minute details, and preparers are ambitious of doing on one slide what can only be properly done on two, three, or four. This ambition results in a radical fault, namely the use of undue pressure, in order to bring all parts of the object to one level. Again, a wish to mount slides rapidly induces the employment of heat in order to harden the balsam quickly. For mounting diatoms, a skilful manipulator tells me that hardening the balsam thus brings out the markings. His slides fully bear out his words. But for insects, nothing can be worse than heat, for it produces an opalescent transparency, which makes markings partially invisible, and this effect is aided by the increased density given to the balsam.

The methods which I venture to recommend avoid the use of undue pressure and of heat, while, at the same time, not only will they give a better general idea of an object than the methods ordinarily in use, but also will bring out details much more distinctly.

Insects cannot all be mounted in the same way, and, according to the points which it is desired to show, so must the method of mounting vary. I will first describe the various media and processes of mounting, and then say something of the different insects for which they are suited.

The media I employ may be divided into two classes: A, those which are aqueous, and B, those which are resinous.

CLASS A. Medium 1.—To every fluid ounce of glycerine add ten drops of ordinary acetic acid. Almost everything may be mounted in this medium. **Medium 2.**—Glycerine jelly. For details of its manufacture I refer readers to *SCIENCE-GOSSIP* 1874, p. 54. Carbolic acid should be used to prevent the growth of fungi, instead of Baric chloride as there stated. I do not recommend glycerine jelly, except in a very few instances, and therefore I do not trouble the reader with what I said at a former time. **Medium 3.**—Distilled water. To every fluid ounce of water add 20 drops of carbolic acid; boil until

the acid be dissolved, and filter through blotting-paper. This medium is solely for mounting specimens of opaque objects.

CLASS B. Medium 1.—Canada balsam. I consider test-tubes by far the most convenient vessels in which to keep this resin. Fill a test-tube with two-thirds of old balsam and one-third of benzine. A friend tells me that new balsam does just as well, but of that I have no experience. The mixture should be of the consistency of cream. **Medium 2.**—Gum dammar. Take two parts of gum dammar and one part of gum mastic: pound them in a mortar, and fill a test-tube quite full of the powder, but do not ram it down: now pour in benzine until the test-tube will hold no more. Cork the tube tightly, and let it stand in an oven for a few hours, until the solution be quite clear and all sediment has sunk to the bottom. Filtering is quite unnecessary. Gum dammar by itself dries very brittle, and besides, I have never been able to clarify it. These mixtures of Canada balsam and of gum dammar may be used indifferently for unstained specimens. I do not know that one is better than the other, but for stained specimens it is better to use only gum dammar, because the natural oils in the balsam cause some colours to fade.

PROCESS I. *To mount an object in glycerine.*—A cell is necessary for all but the very thinnest objects. Fixing a cell is some trouble, but it is seldom that anything deeper is required than a glass slip with a countersunk cell. As some people are always complaining (quite needlessly) of the difficulty of "sealing cells," I describe my method: fill the cell with glycerine; pick out all air bubbles with a pair of forceps, put the object in the cell; take up the thin glass cover with the forceps, breathe on its underside, and place it carefully (do not drop it) on the cell; press the cover down, taking care to keep the object in the middle, and secure it with a clip. Leave the slide for an hour in order that all superfluous glycerine may be pressed out; then take it up and wash it in clean water by dipping it in, and moving it gently backwards and forwards. Wipe the ends of the slide with a towel; absorb all the water about the cover with blotting-paper, and then varnish it *very thinly* with 'Bell's cement.' Knotting varnish, such as is sold in ordinary oil shops will answer the purpose, but slides sealed with this are apt to leak. Therefore I prefer Bell's cement, which can be bought at C. Baker's, High Holborn. Three coats of varnish should be put on before the clip is taken off, and the slide may then be "ringed" on the turn-table in any way that suits the mounter's fancy.

For mounting in jelly I again refer readers to the back number of *SCIENCE-GOSSIP*. Objects may be mounted in water in the same way as in glycerine; washing the slide after putting on the clip, however, is unnecessary.

PROCESS II. *To mount in balsam or dammar.*—With a turn-table draw a ring of water-colour paint

in the middle of the slide. If the object be very thin put a small drop of the medium on the slide, place the object in it, and put on the cover, wetted with benzine, and press it down only very lightly indeed. It is but seldom that entomological objects are thin enough for this, so, in an ordinary way, proceed as follows. On the ring of paint at equal distances apart, place three small chips of cover-glass of a thickness just slightly less than that of the object to be mounted; arrange the object which should be quite wet with benzine, in the middle; put on the cover, secure it with a clip, and let the medium run under by capillary attraction. All bubbles not inside the object will ultimately disappear, but sometimes they need "coaxing" to make them go. The clip must be left on for half a day or a week, according to the nature of the object. Any shrinkage of balsam from the edge of the cover must be carefully filled up. Slides mounted in this way should be left at least six weeks to dry. The superfluous balsam may be scraped off neatly by placing the slide in the turn-table, and using a sharp bradawl to cut the balsam. A good margin of balsam must be left round the edge of the cover. The slide must be first varnished with balsam, but it may be finished according to individual fancy.

If the object be too thick for any bits of cover-glass, I generally use a slip with a countersunk cell. Nothing is easier than to mount with these. I should use them almost always, if they were not twice the price of smooth-edged slips.

I will now speak of the processes for preparing insects for mounting. It is on the proper carrying out of these that the worth and beauty of one's slides depends.

To prepare an insect for being mounted in glycerine.

First process: Simply soak it for a week in glycerine. Second process [to be used if the insect be curled up]: soak it for a day or two in acetic acid, then for half a day in distilled water; this makes the legs spread out. Soak it in weak glycerine; then in stronger, and finally in pure glycerine, then mount it. Third process: For this refer to the first process for Canada balsam. Insects are prepared for glycerine jelly in the same way as for glycerine; for carbolated water they are prepared by simply soaking them in it for some time.

To prepare insects for balsam or dammar.—First process: After partial dissection, soak the specimens in liquor potassæ in the usual manner; when they are sufficiently transparent, complete the dissection, and boil them in clean liquor potassæ for ten seconds: wash them in distilled water, soak them for at least half an hour in acetic acid. [It does no injury to leave them in this for a week, but an hour or so is all that is needful.] This gets rid of all potash. Wash them well in distilled water, and then in methylated spirit. [If they are to be mounted in glycerine instead of in balsam, they should be transferred to that medium without being put into spirits at all, but only well

washed in water.] Soak them for a quarter of an hour in absolute alcohol, and then in oil of cloves for a short time. The oil of cloves is not absolutely necessary, but it is safer to employ it. Objects should not be left for more than a week in oil of cloves, since they are made hard and brittle by it. They may now be mounted in balsam or dammar, but it is better to wash them first in benzine, in which they may be kept for any length of time. Second process: For displaying muscles [applicable to naturally transparent objects only]. Soak for three or four days in ether, transfer at once to oil of cloves. Or, if the object be curled up, soak it in water to expand it, and transfer it to the oil by methylated spirits and alcohol, as described in the first process. Third process: For the same purpose and with the same limitations as process two. Soak for a very short time in potash; be very careful not to press the object at all, and proceed as in the first process, but without any boiling.

For soaking in potash I use half-drachm stoppered bottles; for acetic acid, staining fluids, &c., little glass pots, which I buy at Baker's for 2d. each. For boiling I use little porcelain evaporating dishes with handles, which I buy at Griffin & Sons', 22 Garrick Street, Covent Garden.

(To be continued.)

A NEW METHOD OF PREPARING A DISSECTED MODEL OF AN INSECT'S BRAIN FROM MICROSCOPIC SECTIONS.

By E. T. NEWTON, F.G.S.

(Read before the Quekett Microscopical Club,
January 24, 1879.)

THE structure of the nervous centres of Invertebrate Animals is a subject which is attracting some attention at the present time, and I have myself been much interested in the study of the insect's brain; but have found some difficulty in clearly comprehending the forms of certain of the internal parts. In order to get a better knowledge of these forms, I was led to construct a model, on a principle which I believe to be entirely new. Knowing the interest which our honoured president and the members of this club always take in new methods of working, I felt constrained to bring the matter before you, and it is the purpose of the present paper to describe the manner in which this model has been constructed. Whether the method will prove available for other objects, time alone will show.

It will perhaps be desirable, before commencing the description, for us to call to mind the general form of an insect's brain. Some of us endeavoured on our last "Gossip night" to get a general know-

ledge of the anatomy of an insect, and, with regard to the nervous system, we noticed that the most anterior pair of ganglia, which is placed in the fore part of the head, is joined by two large commissures to the second pair, which is placed lower down, and towards the back part of the head. Through the ring thus formed the gullet or cesophagus passes, and hence the anterior ganglia, being above, are termed

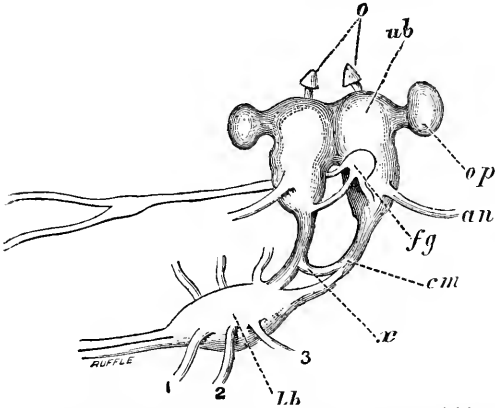


Fig. 91.—Brain of mole-cricket, after Dietl.—*ub*, upper division of the brain, or supra-oesophageal ganglia; *lb*, lower division of brain, or infra-oesophageal ganglia; *cm*, commissures between upper and lower divisions of brain; *x*, a cross-band of fibres peculiar to mole-cricket and some other insects; *an*, antennary nerve; *op*, optic ganglion; *o*, ocelli; *fg*, frontal ganglion of stomato-gastric nerve; 1, 2, 3, nerves to mouth organs.

the *supra-oesophageal ganglia*, and the second being below, are called the *infra-oesophageal ganglia*. The

positions of these parts is very well shown in the diagram of these ganglia, taken from a mole-cricket (fig. 91). The upper ganglia present two rounded prominences above, from the sides of which the optic nerves are given off (*op*), while at the top are seen two ocelli. Somewhat lower down, and towards the front, are two other prominences, from which the antennary nerves pass off (*an*). A little lower down a nerve is given off from each side, the two joining in the middle line to form the frontal ganglion (*fg*); from this a single nerve passes backwards along the upper surface of the alimentary canal. Below and

behind the large commissures (*cm*) pass to the lower ganglia (*lb*), and, being long in the mole-cricket, the two pairs of ganglia are well separated. In some insects they are much closer together.

From the lower pair of ganglia the nerves are given off which supply the mouth appendages. The researches of Faivre, in 1857 ("Du Cerveau des Dytisques dans ses rapports avec la locomotion," "Ann. d. Sci. Naturelles Zool." tome viii. p. 245) seem to show that the power of co-ordinating the movements of the body is lodged in the infra-oesophageal ganglia, and, therefore, it is not without reason that some authors regard these as a part of the brain. What follows in this communication refers only to supra-oesophageal ganglia, or, as I should prefer to call them, the upper division of the brain.

The general arrangement of the internal structures will, perhaps, be best understood by reference to the figure given by Leydig, of the brain of *Formica rufa* (fig. 92). ("Tafeln zur vergleichenden Anatomie," 1864, t. viii.) Upon each side there is a large central ovoid mass (*pl*), which has been termed the *primary lobe*, and this abuts in the middle line upon its fellow of the opposite side, while the optic nerve, with its ganglion (*op*), is given off from the outer or opposite end. The optic ganglion itself is a very complex structure. The antennary lobes (*al*) consist of a number of large rounded masses, which have been called cells, but are really made up of a network of fine fibres. Above the primary lobe are seen the peculiar bodies, having the appearance of half-rings (*mb*), which have been called convolutions, by Dujardin. ("Sur le système nerveux des Insectes," 1850, "Ann. Sci. Naturelles Zool." sér. 3, tome xiv. p. 195), and have been compared to mushrooms.

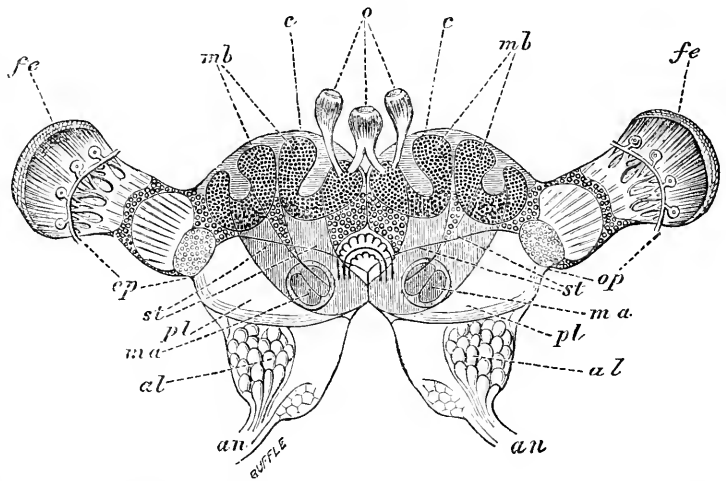


Fig. 92.—Brain of *Formica rufa*, adapted from Leydig.—*pl* primary lobe; *al*, antennary lobe; *an*, nerve to antenna; *op*, optic ganglion; *fe*, facetted eye; *o*, ocelli; *mb*, mushroom-bodies; *st*, stems of mushroom-bodies; *c*, cap of cells covering the mushroom-bodies; *ma*, optical section of the anterior mass of nervous matter.

Each of these mushroom-bodies is supported upon a stem (*st*) which passes downwards into the primary lobe, where the two lie close to each other, if they do not join.

The exact form of these mushroom-bodies is not easy to be made out from preparations such as that figured by Leydig, and, indeed, the appearance presented by sections does not convey a very clear idea of their form.

In the middle of the primary lobe, as figured by Leydig, there is a rounded mass, which he describes

in clarifying the brain (previously hardened in alcohol) in potash solution, or glycerine.

With regard to the origin of the nerves of the ocelli (*o*), it is desirable that Leydig's figure should be verified, for it seems very improbable that they should arise from the heads of the mushroom-bodies in the ant, and from a different part of the brain in other insects.*

Insects' brains vary very considerably as regards the development of the mushroom-bodies. In ants, bees, and wasps they are proportionately large, and double on each side. In the cockroach they are double, and moderately well developed, and in the mole-cricket there is said to be only one on each side. Dujardin could not detect these mushroom-bodies in the diptera; but recent investigations (E. Berger, "Untersuchungen über den Bau des Gehirns und der Retina der Arthropoden," "Arbeiten des zoolog. Instituts zu Wien," Bd. i. Heft ii. p. 173) show that certain bodies exist in the blow-fly (*Musca vomitoria*), and the house-fly (*M. domestica*), which, most probably, are correctly regarded as the homologues of mushroom-bodies.

I had already prepared sections of the heads of several insects, some of which have been exhibited at our meetings, before I saw the paper by Dr. Dietl ("Zeitsch. f. wissenschaft. Zool." 1876, vol. xxvii. p. 488), in which some beautiful sections of insect brains are figured and described. When I saw them I determined to try the method he had used for hardening the brains, namely, with hyper-

osmic acid. The insect which I selected to work upon was the cockroach (*Blatta orientalis*). In the first place it was necessary to remove the brain from the head in a perfectly fresh condition, and this required some care, because the organ itself is extremely delicate,

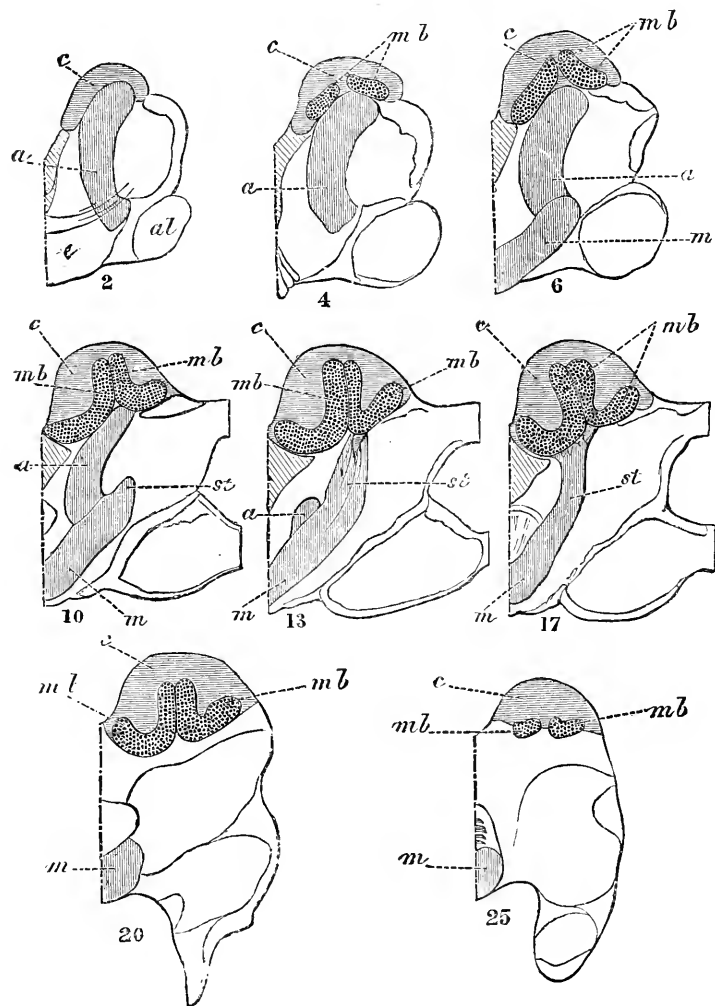


Fig. 93.—Diagrammatic outlines of sections of the upper part of the brain of a Cockroach. Only one side of the brain is here represented. The numbers indicate the position in the series of 34 sections into which this brain was cut. *mb*, mushroom-bodies, with their cellular covering; *c*, and their stems, *st*; *a*, anterior nervous mass; *m*, median nervous mass.

as a "giant nucleus" (*ma*), but more recent researches have shown that Leydig was mistaken, and that this appearance is really the optical section of a cylinder of nervous matter, which passes forwards, to end abruptly upon the front surface of the brain. The structure was correctly described by Dujardin, in 1850, but does not seem to have been recognised by Leydig; this was, no doubt, due to the method of investigation employed by the latter, which consisted

* I find, since this paper was written, that according to Flügel, these nerves pass down beside the mushroom-bodies to the middle of the brain. ("Zeitsch. f. wissenschaft. Zool." 1878, vol. xxx. suppl. p. 556.)

and if the investing membrane be injured the internal parts are apt to be squeezed out in the hardening process. The fresh brain, cleared from the surrounding parts, was placed for a few hours (6 or 8) in an aqueous solution of hyperosmic acid ($\frac{1}{4}$ to $\frac{1}{8}$ per cent.) It was then washed and laid in spirits of wine. The hyperosmic acid seems to me to be somewhat uncertain in its action, for sometimes the brains remained soft and unstained in the interior, while at other times the hardening and staining was most successful throughout.

The next point was to cut up the brain in a definite direction into consecutive sections of a known thickness.

So much has been said in this club lately about section cutting, that it would only be wearisome to attempt to describe the process fully. It may, however, be mentioned that a microtome was used, in which the screw for raising the object was divided, so as to register a thickness of about $\frac{1}{1000}$ inch. The brain was embedded in wax, in the usual manner, and each slice, as it was cut off, was placed directly upon a glass slip in a drop of glycerine, and numbered. When the entire brain had been disposed of in this way, the sections were cleared of the pieces of wax adhering to them, covered with thin glass, and cemented down.

The sections which appear to me the most instructive are those cut in a direction as nearly as possible parallel to the front of the brain. One brain, cut in this direction, gave me thirty-four slices, each about $\frac{1}{1000}$ inch thick, and as no intermediate pieces were lost—although some were subsequently injured in the process of mounting—I had the whole of this upper division of the brain in a consecutive series of slices, and, therefore, in a very satisfactory condition for work. Any one who, in working out structures by means of sections, has endeavoured to trace the various parts through a series of slices, will understand how difficult it is to keep in mind the structures seen in each, so as to picture to himself the form of any part when entire. And still more difficult is it to convey to others the knowledge which one has gained by the examination of such a series.

Now it seemed to me that, if a drawing of each section of the series were made, and the corresponding portions in each coloured some definite tint, then the structures presented would be much more easily understood, inasmuch as they could all be laid before the eye at one time. I determined, therefore, to prepare such a series of drawings with the camera lucida, and the diagrams numbered 2, 4, 6, 10, 13, 17, 20, 25 (fig. 93), represent the most typical sections of this series; only one-half of each section being here represented.

In section No. 2 may be seen, at the lower part, a portion of the antennary lobe (*a*l). In the middle is a mass of nervous matter, here distinguished by vertical lines, and marked (*a*). Above this is a cap-

like portion, distinguished by horizontal lines (*c*). These are the portions which should be borne in mind in passing through the series.

In No. 4 we find that while the parts noticed in No. 2 remain much the same, two dark masses (*mb*) have appeared in the upper portion, close to the mass (*a*), but definitely separated from it.

In No. 6 the dark masses have increased in size and become somewhat curved, but the most obvious difference is that the mass (*a*) has suddenly extended inwards and downwards to the middle line of the brain (*m*).

In No. 10 the dark masses are much more deeply curved, the upper portion of the mass (*a*) is rather less, and another process has begun to extend upwards and outwards (*st*).

In No. 13 the most important point to notice is that, while the inner mass (*a*) has almost disappeared, the outer one (*st*) has extended upwards, and may be seen to join the outer dark mass.

In the 14th section the outer mass (*st*) joins the inner dark mass also, and this junction extends as far as the 18th or 19th section.

In No. 17 the outer mass (*st*) may be seen joining both the dark masses, which are here very deeply hollowed out.

In No. 20 the outer mass has entirely disappeared, and we have simply a small portion of the lower mass (*m*) left close to the middle line, the dark masses are somewhat smaller. The extension (*com*) seen just below the antennary lobe is the commencement of the commissure to the lower division of the brain.

In the sections which follow, all the parts above mentioned, excepting the commissure (*com*), get gradually less, and the dark ones are seen, for the last time, in section No. 25. The median portion (*m*), however, may be traced to the 28th section.

The next step in the process was this: It occurred to me that, if the card, upon which these outlines were made, were of a thickness proportionate to the enlargement of the drawings, and if each were cut out, and the whole piled together, one ought to have a model of the exterior of the brain. I set to work, therefore, to do this, but in order to lessen the labour as much as possible, it being merely an experiment, it seemed desirable to make one half first, and instead of making models of the whole series, the thickness of each slice was doubled, so that it was only necessary to make seventeen, taking, as a pattern, every alternate drawing.

The material used was soft pine-wood, each piece being about $\frac{1}{8}$ inch in thickness. Having cut out each model slice with a fine saw, the whole were piled together in their relative places and temporarily fixed, so that the corners might be trimmed off, and the result was the form which is seen in the model of one half of the upper brain (fig. 94). The different slices, however, were not left fixed together, but were separated and arranged so

that they might be taken to pieces, as in the process of cutting sections, and the surfaces thus exposed were coloured to represent the sections as they appear under the microscope.

This method of modelling was capable of still further development. Having modelled the opposite half of the brain upon the same plan, I drew upon each of the model sections, thus produced, the outlines of the more important parts, as shown in the

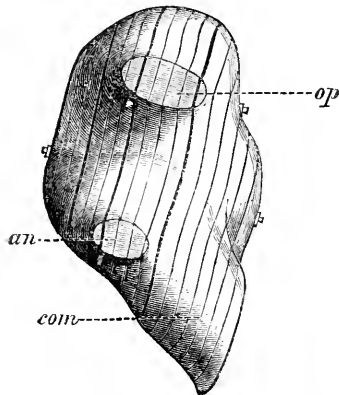


Fig. 94.—View from the outer side of the left half of model of upper part of brain of Cockroach. The oblique lines in this and fig. 95 indicate the successive slices of which each is composed. *op*, cut end of optic nerve; *an*, cut end of antennary nerve.

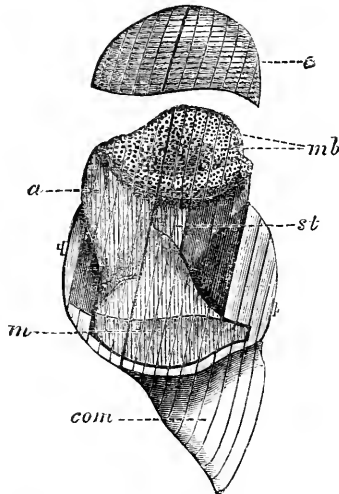


Fig. 95.—Right half of model-brain seen from the inner side, with the parts dissected away, so as to show the anterior nervous mass, *a*; the median mass, *m*; the mushroom-bodies, *mb*; and their stems *st*. The cellular cap, *c*, has been raised, so as to display the parts below; *com*, is a part of the commissure to the lower portion of brain, or infra-oesophageal ganglia.

diagrams (fig. 93), and these were then cut out in the same manner as a child's dissected map-puzzle. Now it will be obvious that by taking from each of these "dissected" sections, the part, for instance, which is in the diagrams (fig. 93), marked (*c*), and joining them together in their relative places, we shall have a model of that particular part; and by joining, in like manner, the dark masses, and those marked (*a*), (*m*), (*st*), we shall obtain models of the mushroom-bodies, with their stems, etc. In this manner the dissected portions of this side of the brain were joined together, and, after some little trouble in adjustment, one was enabled to make the parts fit together in their relative places. We have now, therefore, upon the *left* side, a model which may, so to speak, be cut up in slices, to show the microscopic appearance of the sections (fig. 94), and on the right side, a model of the more important internal structures, which may, as it were, be dissected out before a class of students (fig. 95).

I was in hopes that, before reading this paper, I should have been able to construct a similar model of the brain of a bee, in order to verify the descriptions of Dujardin, Dietl, and others, who have worked at

this insect, but have not yet had the opportunity. This, I may say, however, that an examination of this model goes far to prove the correctness of their descriptions, for we see here a mass of nervous matter ending abruptly on the front surface of the brain, this extending backwards, and being joined by the stems of the mushroom-bodies, and reaching nearly to the back of the brain, after being gradually reduced in size. The heads of the mushrooms are seen to be,

as described originally by Dujardin, discs folded upon themselves, and bent downwards before and behind. No doubt the forms of these parts differ in the bee and the blatta, but still, in their principal features, they are much alike.

I cannot help thinking that a model such as this gives a far better idea of the true form of the internal parts, than it is possible to obtain from a study of sections alone, and, indeed, even if these minute structures are dissected out, there is great fear of their being distorted in the process.

But, after all, the great use of such models is to enable the lecturer, or demonstrator, to convey to his students a correct knowledge of the parts under consideration, and I trust that this model may be the means of enabling some of us to comprehend, more easily than we otherwise should, the complex structures of an insect's brain.

BOTANICAL WORK FOR MAY.

BRITISH BATRACHIAN RANUNCULI.

SOME ten years ago we could not (perhaps being a little prejudiced) believe that all Babington's water ranunculi were specifically distinct; however, time has wrought a wonderful change in our opinions; we now look upon them as a beautiful series of examples, all differing in some degree, yet linked together to form one harmonious whole; we hope to carry this conviction home to all our readers. We have often been surprised to find so few of our botanists who seemed to care to study these plants, and yet they all confess they should like to know more about them; now let us endeavour during the present month, to search anew every pond and ditch in our neighbourhood, and carefully compare specimen with specimen: we shall all be astonished at the



Fig. 96. The Water Crowfoot (*Ranunculus aquatilis*).

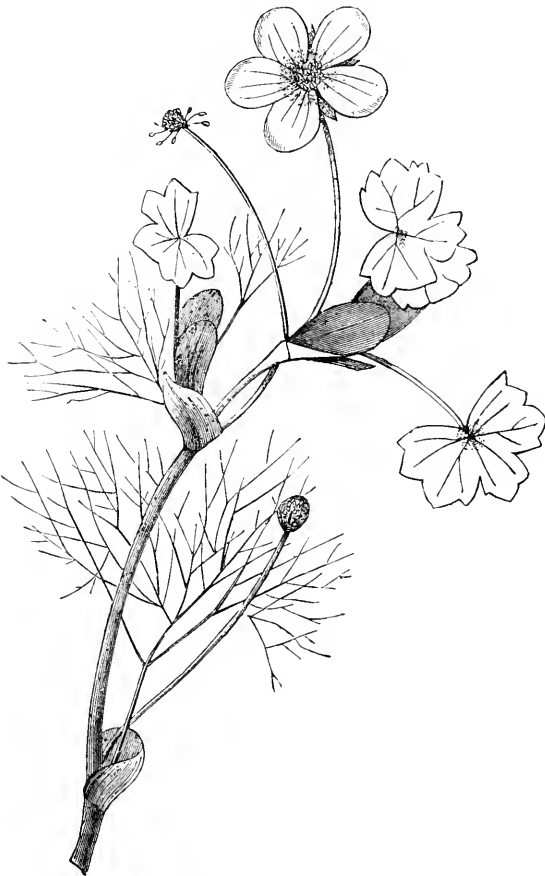


Fig. 97.—*Ranunculus heterophyllus*.

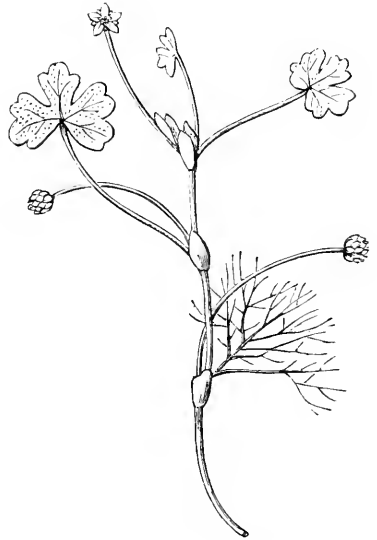


Fig. 98.—*Ranunculus tripartitus*.

result. To many of our readers this will add a new study to one which is getting threadbare.

Our space being necessarily limited, we may be pardoned by passing over the history of the Batrachian ranunculi, without any remarks; our object is to make them simple and plain to every botanist, for so far as our flowering plants are concerned, they ought to be recognised at a glance.

First, looking at the whole of our aquatic ranunculi, we readily perceive they naturally divide into two sections:

(A.) Found growing only in muddy or boggy places, and devoid of submersed leaves.

(B.) Floating water plants.

Section I.

1. *Ranunculus hederaceus* (Linn.). Leaves spotted, small. Flowers very small; petals 3-veined. The point of the style, on the carpel (seed-vessel) always at the side.

2. *R. Lenormandi* (E. B. S.). Leaves much larger than above, not spotted. Flowers large; petals 5-veined. The obovate carpel with a terminal point; syn. *R. cœnosus*, (Guss.)

Section II.

Div. I. *Without floating leaves.*

3. *R. trichophyllus* (Chaix). Submersed leaves dark green; segments short, rigid, apiculate. Flowers very small. Easily known by its short, pointed, dark green leaf-segments.

4. *R. Drouettii* (F. Schultz). Submersed leaves bright green, segments collapsing (*i.e.* when taken from the water they are like a camel's-hair pencil when in use), not apiculate.

5. *R. fluitans* (Lam.). Submersed leaves very long, linear. Flowers very large. Generally found in shallow rivers, abundant in the Severn.

6. *R. circinatus* (Sibth.). Segments all in one plane, rigid, in a round-

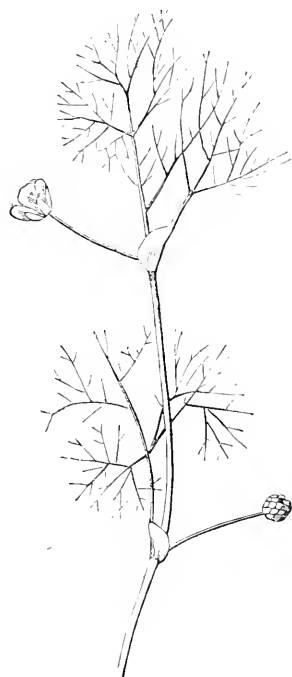


Fig. 99.—*Ranunculus Drouettii*.

ish outline, forming a flat, rigid disk. Flowers very small.

Div. II. *With floating tripartite leaves.*

NOTE.—All the species comprised in this division may be recognised better from the illustrations, the characters bear such a strong resemblance or similarity, except to those who have studied them long and carefully.

7. *R. heterophyllus* (Sibth.). The submersed leaves of this species have long filiform collapsing segments. Floating leaves nearly circular in outline, and with long petioles; style hooked.

8. *R. confusus* (Godr.). Leaf segments not collapsing, rigid. Floating leaves semicircular, flat; style recurved. The stem of this species rises out of the water.

9. *R. Baudottii* (Godr.). Floating leaves tripartite. Leaf-segments olive-green, apiculate, not collapsing. Flower stalks often exceed the leaves in length. Carpels inflated at the end.

10. *R. peltatus* (Fr.). We combine *R. floribundus* (Bab.) with this species, being unable to detect any difference. Flowers numerous, sweetly-scented, large. Floating leaves almost circular in outline.

11. *R. tripartitus* (DC.). St. rising out of the water. Pets. very small, often slightly tinged with pink. The

submersed leaves often absent, then it has a close resemblance to *R. Lenormandi*. It is a very distinct species.

12. *R. pseudo-fluitans*.—Submersed leaves long,

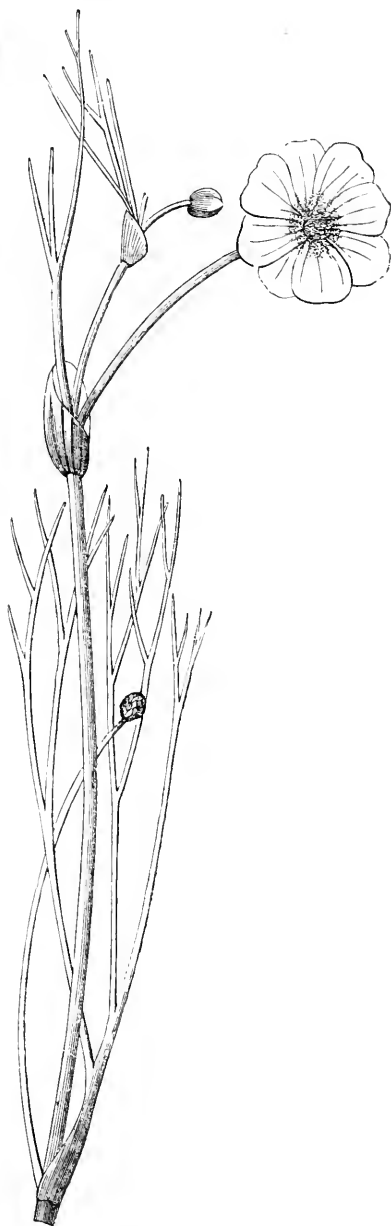


Fig. 100.—*Ranunculus fluitans*.

with flat segments resembling *R. fluitans*. Floating leaves tripartite. Flowers (rarely seen) about as large as *heterophyllus*. This is a very variable plant, sometimes the segments are collapsing, but more frequently long and rigid.

The following characters are most reliable :

No. 3. Known at a glance by its dark green leaf-segments ; No. 4. Leaf-segments light-green, filiform and collapsing ; No. 5. Leaf-segments very long, linear ; No. 6. Segments of leaves having a roundish outline, and all in same plane ; No. 7. Floating leaves almost



Fig. 101.—*Ranunculus Lenormandi*.

circular ; No. 8. Floating leaves flat, semicircular ; No. 9. Floating leaves tripartite ; No. 10. Flowering abundantly, and with delicate perfume ; No. 11. Flowers exceedingly small, submersed leaves very rare ; No. 12. Differs from No. 5 chiefly, by having floating leaves.

MAY FLOWERS IN WALES AND SHROPSHIRE.

IN Hertfordshire the primroses were over, hyacinths run to seed and later summer flowers coming into blossom, when in the middle of May we left that county for Shropshire, and stayed at Bucknell, on the borders of Wales. Here, the early spring and the summer flowers were all in blossom together. We climbed a high hill and passed through an oak wood, where the ground was covered with primroses and anemones, side by side with *Geranium sylvaticum* and *Lychnis*. Masses of beautiful broom grew on these hills, *Chelidonium* in the hedgerows and meadows full of *Orchis morio*. We walked one day from the Craven Arms Junction, where the rail to Ludlow branches off, to Norton Camp on the top of the hill. Close to the camp is a wood, where we found *Saxifraga granulata* growing as thickly as *Stellaria Holostea* does in Hertfordshire. It looked very pretty in the long grass on the ledges of the steep rocks which overhang the valley where Stokesay Castle lies. From Craven Arms Junction it is but a short distance by train to Church Stretton, which looks so charming lying close under the range of wild hills.

The Longmynd is windy and treeless, but there is

plenty of beauty and colour about it. Along the top is a broad turf track, smooth as a racecourse, along which we walked. We could see the Wrekin and Malvern Hills as we climbed upwards from Church Stretton, afterwards on the left the Ludlow Hills and Clec Hills ; on the right we looked across those strange Stiper stones, and out to the Welsh hills over the fertile valley, where we could see Bishop's Castle.

The colour of the foreground to these distant blues and pale greens was very remarkable, owing to the splendid tints of the whortleberry leaves. On the Longmynd they grew in spreading tracts over the turf, shading from a deep crimson to brilliant orange. The plants were full of light pink blossoms, and our feet were covered with honey as we passed through them. When nearly at the end of the Longmynd range, we descended to the left into the valley near the branch line that runs to Bishop's Castle. This railway is certainly very rural and unsophisticated ; it is grown with grass and weeds, and as we came up a flock of sheep which had just been washed in the river close by, was driven slowly along the rails with much baa-ing and barking of dogs. Children played on the line and strolled hand in hand under the gay broom bushes which hung in the cutting, oak boughs and firs drooped over the fences on either side, and almost hid the signal-post. We walked along the line also ; the sheep turned off at the little shed which served as a station. I sat down to sketch on a heap of old sleepers until in course of time a short train came slowly up ; the children disappeared, the shepherd with his dog under his arm stood to watch us start, the broom came in at the windows as we passed along.

On the rocks above the Teme, when on our way along the hills to Ludlow, we found *Lithospermum arvense*. Wild garlic spread like a carpet over some of the woods.

The month of May was a very wet one, even for Wales. We went to Rhayader by the Builth railway in pouring rain, past dreary Llandrindod with its miserable attempt at modern streets and smart hotels, in the midst of what was once a pretty common enough if uninteresting. At Builth Road we saw the name of that station very neatly written in fine thrift, which can be recommended to station-masters. The letters are bright green all the winter and covered with pink blossoms in the summer. We drove from Rhayader up the Nantgwyth valley, beside the Elan, which was like a winter torrent, and saw at the edge of the oak woods the pale yellow flowers of the Globe Flower (*Trollius Europæus*). Later on we walked through meadows full of *Trollius* near Rhayader and Builth. Close to Cwm-Elan is the "Lily Bank," of rocks and oak-trees, with lilies-of-the-valley growing thickly in beds along the ledges ; the blossoms were just coming out.

We found plenty of *Pinguicula* in blossom on the hills, looking like large bright violets, also *Gnapha-*

lium dioicum. Bird-cherry grew in the hedges. In one place was plenty of buckbean (*Menyanthes trifoliata*). Oak-fern grew near the Elan, and beech-fern almost under the little mountain waterfalls. Some of the old walls were full of common spleenwort and *Cystopteris fragilis*.

We went to Aberedw, near Builth, and walked over the hill to see Llewellyn's Cave, a little three-cornered hole with a wooden door. On our way we found *Saxifraga hypnoides* amongst the rocks, and some tall specimens of *Meconopsis Cambrica*.

Pinner's Hill.

M. A. TOOKE.

MICROSCOPY.

POLLEN.—It is pleasant, if only for a moment, to turn away from the bloodshed of Zululand to the calm possibilities of scientific research and induction. This is suggested to us by a capitially-printed paper we have received on "Pollen," read before the Natal Microscopical Society in November last by Mr. Maurice S. Evans. This paper is a valuable one, and gives us a good deal of original research. In the discussion which followed, Mr. Adams (the hon. secretary) referred to Taylor's "Flowers; their origin, shapes, perfumes, and colours," in which it was stated that ants never assisted in fertilising plants, the hairs of which the author thought were intended to keep the ants off. Mr. Adams said he had himself seen ants not only carrying off pollen, but entire anthers. This, however, only proves that ants are unwelcome visitors to flowers. What is meant by the author of "Flowers" is not that ants were unable to carry off pollen, but that they were unable to beneficially effect cross-fertilisation, and that they are insects to be guarded against by flowers, rather than welcomed.

QUEKETT MICROSCOPICAL CLUB.—A conversation of this society took place at University College on March 14, and was attended by upwards of a thousand visitors. The guests on arrival were received by the President, Professor T. H. Huxley, who was supported by the Vice-Presidents and Secretary. Microscopes to the number of 185 were exhibited in the museum and libraries by members and their friends from kindred societies, in addition to which a large number of instruments and objects were displayed by the principal opticians. An interesting lecture "On Curious Houses and Queer Tenants," was delivered by Mr. May in the Mathematical Theatre, and frequent exhibitions of polariscope and other beautiful objects and preparations took place in dark rooms by means of oxyhydrogen microscopes; whilst an excellent band discoursed sweet music in the famous Flaxman Hall. The general arrangements were such as to call forth much praise, and the great scientific interest and admirable manner in which the greater part of the microscopic objects were shown

could not fail to be remarked. In addition to the microscopes there was a good display of stereoscopes and objects of interest, including a number of scientific diagrams contributed for the occasion by Messrs. Hardwicke & Bogue.

A NEW METHOD OF PRESERVING INFUSORIA.—The development of minute animalcules in infusions of animal and vegetable substances when undergoing decay has excited much interest amongst the medical profession, on account of the light which recent researches have shed upon the mode which bacteria have of spreading disease. For the study of these minute forms it is very desirable that we should possess some means of obtaining a permanent preparation of them which would facilitate their examination. As regards bacteria and vibrios, especially those on which M. Pasteur's researches have shed so much light, and also those of Professor Tyndall, I have been experimenting upon a method by which this could be done; and after some years of patient research I have at last been rewarded with a very excellent method, and for the benefit of the readers of SCIENCE-GOSSIP I now send it you. The following things will be necessary:—A bottle of thin Canada balsam diluted with chloroform, a hot-water plate and a few glass dishes, and the fixing solution, which is made in the following manner: to 25 cc. of chromic oxydichloride acid is added 50 cc. of water with 5 cc. permanganate of potash. First draw a large ring of white wax upon the slide much larger than the covering glass, then place the vorticellas which you wish to preserve in the ring with some water. When they have attached themselves to the slide some of the chromic oxydichloride solution must be added, which will instantly fix the specimen in the position. After remaining about three minutes the water may be poured out, and a few drops of chloroform added and poured off, the covering glass placed carefully on, and a few drops of dilute Canada balsam added so as to flow under the cover, which is then placed upon the hot-water plate to dry. Specimens preserved in this manner retain all the freshness of the living animal.—T. C.

ZOOLOGY.

JAPANESE DEER.—At a recent meeting of the Zoological Society, the secretary called the attention of the meeting to the herd of Japanese deer (*Cervus sika*) in the park of Viscount Powerscourt, at Powerscourt, in Ireland, now about eighty in number, and gave an account of their introduction and history, from particulars supplied to him by Lord Powerscourt.

FEMALE DEER WITH ANTLERS.—This was the subject of a paper by Mr. Edward R. Alston, read before the Zoological Society, showing that these

weapons are not unfrequently abnormally developed in fertile females of certain species of *Capreolus* and *Cariacus*, and giving reasons for believing that in the ancestral forms of deer, they were probably common to both sexes.

THE DEATH OF THE MANATEE.—Mr. Reeves Smith, of the Brighton Aquarium, writes: "Will you allow me to supplement the interesting observations which have already appeared in your contemporaries on the above subject with the following facts? The sirens were formerly no strangers to the shores of Britain, for the near relative of the manatee, the halitherium, occurs as a fossil in the red crag formation of Suffolk. The fossils, though found in the Red Crag of Suffolk, are yet generally considered by geologists as derived from much earlier beds of the Miocene age, which once occupied a large area of what is now the German Ocean, whence they have been washed out and redeposited, on the coast of Suffolk. Similar remains are also found in the miocene of Belgium and Germany. The discovery of the British species formed the subject of a paper by Professor W. H. Flower, F.R.S., Hunterian Professor of the Royal College of Surgeons, and now President of the Zoological Society, published in the quarterly journal of the Geological Society for February (vol. xxx.), in which further details will be found." Two skulls of this fossil Sirenian (called *Halitherium Canhami*) are known, one of which (that described by Professor Flower) is in the Ipswich Museum.

MISTAKES MADE BY INSTINCT.—In answer to J. E. Taylor's suggestion under this heading I send the following instances of mistakes on the part of the humming-bird hawkmoth. While staying at Aigle one summer, I occupied a room hung with a light paper on which dark green diamonds of about an inch square frequently occurred. I observed a humming-bird moth apparently attempt to strike its proboscis into a number of these squares in succession, and as far as I could see choosing the centre of each for its attack. I may mention a similar occurrence which I noticed last winter at Mentone, but in this case the pattern of the paper was wreaths of flowers, but curious to say the moth selected one flower of rather a dark colour, and hovered from one example of it to another without apparently observing the intervening patterns. I may mention that this moth is called in the south of France "good news," as it is supposed to be an omen of future happiness.—*Ebba, Cotford, Sidmouth.*

ZEUS APER, OR BOAR-FISH.—A specimen of this rare visitant of British waters was obtained from a French trawler at Exmouth, on the 19th ultimo. It was caught in the Channel, off the Devonshire coast, and was still alive when brought ashore. Although common in the Mediterranean, Yarrell in

his "History of British Fishes" (vol. i. pp. 169-170) mentions only two instances of this fish being caught on the English coast, one in October, 1825, in Mount's Bay, and another (locality of capture not stated) obtained in Bridgewater fish-market in April, 1833. Probably others may have since been captured. The Exmouth specimen measured exactly $5\frac{1}{2}$ inches in length, and corresponded in almost every particular with the excellent description and figure given by Yarrell. No transverse bands, however, were observable on the sides. A lateral line was distinctly visible when the fish was first seen, but in a few days thereafter it had entirely disappeared. The foregoing notes had just been written when another specimen was brought to me this afternoon. It had been caught in the morning in the Channel, about sixteen miles off the coast, and was landed at Budleigh-Salterton. It was nearly an inch longer than the Exmouth specimen, and the transverse bands, although faint, could be distinctly made out. This specimen was forwarded to the Editor of SCIENCE-GOSSIP.—*D. S., Exmouth.*

[We have received one of these specimens of *Zeus aper*, in excellent condition from D. S., and beg to thank him for it very sincerely.—*Ed. S.-G.*]

BOAR-FISH (*Zeus aper*).—Six or seven specimens of the boar-fish have been washed on shore here during the last fortnight, only two having been seen before within the last twenty years. I can only account for their appearance by supposing that the prevalence of north-east winds has driven them in from some station in deep water, such as Couch mentions off the Runnel Stone. These same winds have driven on shore still more unusual visitors in the shape of three large vessels, one of them the celebrated American frigate "Constitution."—*Julia Colson, Swanage, Dorset.*

MARINE ZOOLOGY.—I feel certain that much valuable information in reference to marine dredging might accrue if the various readers of SCIENCE-GOSSIP would give their local knowledge and experience for the benefit of other naturalists. Dredging, as a rule, is not successful, unless the locality is thoroughly well known and familiar; indeed, at many places along our coast, if the dredge is not placed over the exact spot, the haul would be fruitless in its results. Whilst on a dredging cruise last year, I always made notes of those places where the dredge had been used, so that at any future time I could return to the same locality. I did this by roughly marking the position on the chart, and where it was possible I made use of land marks, such as, for instance, a church or a windmill in a line with a large tree bearing N.E. A side mark, or, technically speaking, a thwart-mark was then noted, such as the headland just clearing the light-house; this object should be at a right angle to the first observation, or as much so as is practicable. In returning to the same position,

it is only necessary to sail until the two lines cross each other. As I hope shortly to commence dredging operations, visiting Weymouth, Torquay, Plymouth, Falmouth, Penzance, and the Irish Channel, any information relative to the dredging of these places, would be to me of great service.—*C. P. Ogilvie, Leiston, Suffolk.*

"THE POPULAR SCIENCE REVIEW."—The last number of this excellently edited and old-established quarterly journal is a capital one. It contains articles on "The Sources and Uses of Iron Pyrites," by J. A. Phillips, F.G.S.; on "The Evolution of the Elements," by M. M. Pattison Muir, M.A.; "The Structure and Origin of Limestones," by H. C. Sorby, F.R.S.; "The Supposed New Crater in the Moon," by E. Neison, F.R.A.S.; "Entomology," by the Editor (W. S. Dallas, F.L.S.); "The Collapse of the Electric Light," by W. H. Stone; "The *Feræ Naturæ* of the London Parks," by J. E. Harting; &c.

NOTES ON THE COLOUR, AND ON MOUNTING "NOCTILUCA MILIARIS."—It is well known that to the *Noctiluca miliaris*, the phosphorescence of the sea is due, at all events, in our own temperate waters. Now, although like many of my brother naturalists, I occasionally go to the sea-side, on botanical and zoological thoughts intent, yet, strange to say, I never saw the phenomenon until last summer, and have always thought that the descriptions I have read in books have been very much overdrawn. For instance, in "*Le Monde de la Mer*," by Mons. Moquin-Tandon, there is a particularly graphic description. It must be confessed that this account is very much like the phenomenon in one particular, it is both luminous and glowing; but at the same time it is accurate. Myself and Dr. Worrall had been in a yacht to a place some miles from Bangor, North Wales, for zoological purposes. It was evening before we returned, as the tide was against us, and the wind, which had favoured us going, had at last utterly failed us. The sea was placid, and it was when we had fairly got into Beaumaris Bay, that the full beauty of the phenomenon was apparent. The description was, as far as we could test it, true to nature. We collected in vials numbers of the little *Noctiluca* for examination when we arrived at home (the hotel). When we had pretty well exhausted its points of interest, we set about mounting some for future examination. We mounted them in shallow cells, with various preservative media, that we might compare the results. We tried balsam, glycerine, water (marine and fresh), glycerine jelly, Dean's medium, and several others. One or two of the slides rapidly deteriorated, others held out for a longer period, but the specimens mounted in sea-water, retained all their freshness to this date. As the animals retain their shape, it would appear that there has been no endosmose or exosmose action going on.

The morning following our excursion, our boatman (himself a collector) brought us a two-quart bottle rather more than half-full of a red-lead, or rather orange-lead coloured substance which he called spawn of some kind, and he had brought it to us for microscopical examination. On placing a small portion under the microscope, we found it to consist solely of dead *Noctiluca*. Shortly afterwards we took a stroll along the shore, accompanied by our friend the boatman, and he showed us all along the shore an orange-red line consisting of the dead bodies of the *Noctiluca*, just as they had been left by the receding tide. Having seen no account of the animal possessing colour, I thought it might interest the readers of SCIENCE-GOSSIP to be made acquainted with this peculiar fact.—*John E. Lord, Rawtenstall.*

BOTANY.

TERATOLOGICAL NOTES.—Noticing in your late numbers various accounts of malformation of plants and flowers accompanied by sketches, I am induced to trouble you upon the subject. With regard to the sketch of a "monstrous calceolaria," in your February number, it is of the most common occurrence, especially in the "Prince of Orange" variety, as I have had year by year many identically similar malformed flowers, both in the red and yellow varieties, blooming in my garden, but have noticed that the plant producing them, although apparently vigorous, soon withered and died. I send you with this communication a synanthic cyclamen, which I believe to be very unusual, but this also is the produce of a weakly-grown bulb. May not these abortions be traced rather to a last effort of expiring nature than to any variations of soil or climate, just as dying fruit trees often pour forth an abundant bloom which never matures, and the tree shortly dies?—*J. I.*

RARE SPECIES FOUND IN JERSEY.—I found *Diotis maritima* and *Centaurea paniculata* in large quantities on the hillside at St. Ouen's Bay, Jersey, during the past season. I thought our readers would like to know that they still exist in their old localities.—*W. H. Jones.*

ECHIU M ANGLICUM (RAY).—Upon looking over an old edition of Hudson's "Flora Anglica" I saw this species described, also there are a few notes upon it, made by myself from actual specimens, collected in 1871 at Homer, Shropshire. It is evidently first described by Ray (vide Synopsis, p. 35), so that it is not a species made to-day upon insufficient grounds. Hudson ("Flora Anglica," ed. 1762), has three species, distinguished as follows:

1. *E. vulgare*, caule simpliciter erecto, foliis caulinis lanceolatis hispidis, floribus spicatis, staminibus corollam æquantibus. Viper's Bugloss.

2. *E. anglicum*: *Staminibus corolla longioribus*. English Viper's Bugloss.

3. *E. italicum*: *Corollis subaequalibus vix calycem excedentibus*, margine villosis. Wall Viper's Bugloss.

The habitat of No. 1 is in fields frequent; No. 2, pasture fields and waysides frequent; No. 3, Jersey. We think it a pity this species should be lost sight of, not that we believe the character, depending alone upon the length of the stamens, is very valuable as a specific distinction. But the Homer examples have a widely different habit. Stem procumbent at the base, the leaves are linear, and with a soft pubescence, and the petals are not more than half the size of No. 1. Stamens always exerted.

NOTE.—This species (English Viper's Bugloss) occurs frequently, both in Staffordshire and Shropshire. In the above year we could easily detect it from *E. vulgare*; when riding along the highways we could with ease tell the difference. Would our readers give it their attention, during the coming season, and let us know the result? for it is not pleasant for a species bearing such an honoured name, to be overlooked.

SALICORNIA.—Hudson, again following his earnest predecessor Ray, makes out five distinct forms from *S. herbacea*; probably they are merely varieties of a lax type; however, we mention them to invite the study of our enthusiastic amateurs. It requires a little courage to face mud flats on the banks of our tidal rivers—this may partly account for our limited knowledge of these plants. We shall again shortly refer to, and describe the forms in our herbarium.

UNIVERSITY COLLEGE, LONDON: LADIES' BOTANY CLASS.—The Rev. George Henslow, M.A., F.L.S., &c., lecturer on botany to St. Bartholomew's Hospital, is about to deliver a course of twenty lectures on botany to ladies. We are glad the authorities have been so public-spirited as to throw their classes open to women as well as men.

GEOLOGY.

CARBONIFEROUS FENESTELLIDÆ.—On Feb. 26, Mr. G. W. Shrubsole read before the Geological Society an important paper, entitled "A Review of the British Carboniferous Fenestellidae," and all who have made any attempt to determine species of *Fenestella* must have felt how much a revision was required, and in what an unsatisfactory state our knowledge of the Fenestellæ has been. That Mr. Shrubsole should reduce the number of species very materially was only what those acquainted with the subject would expect, and who would not be much surprised at his reducing the nineteen so-called species which have come under his notice to five.

Mr. Shrubsole has had splendid material to work

at from Halkin mountain in Flintshire, and in this locality he has seen a specimen of *Fenestella plebeia* having a circumference of two feet, and this shows that the variations of different parts of the colony are very great, so that "the young, the mature, and aged condition of the same Polyzoan have been described as distinct species; a similar honour being sometimes conferred upon the base and the upper growth." In the paper it is maintained that the true type is *Actinosoma*, which has eight denticles set round the margin of the aperture. This structure however seems only to have been as yet discovered on three species, and we shall look forward to future papers from the same author, to explain how far he would hold this to be the case; for *Polypora* and *Glauconome* must certainly be considered as belonging to the *Fenestellidæ*, even if they may not have in part to be united in the genus, and the covers already pointed out by Professor and Mr. Young as covering the aperture of *Polypora* and the tuberculated margins of *Glauconome flexicarinata* make it difficult to understand how these cells, at any rate, could have had raised peristomes with denticles like *Actinosoma*. We may add that though there is so much resemblance to the bryozoa, or polyzoa, yet that their connection with more recent forms has never been worked out; and that although there are some points of affinity with *Cheilostomata* and some with *Cyclostomata*, proofs as to their exact position are yet wanting, and we may therefore be allowed to point out to Mr. Shrubsole, that if he can bring forward any points of shell structure, to elucidate the question, he will be adding much to the great importance of this first communication.

THE RAINFALL OF THE WORLD.—This is the title of a pamphlet by Mr. E. D. Archibald, in which an ingenious attempt is made to simplify the general question of a connection between sun-spots and rainfall; and in it our readers will find a full statement of the supposed relation between famines and sun-spots.

THE GEOLOGISTS' ASSOCIATION.—We have received Nos. 7 and 8 of the Proceedings of this vigorous society, in which Mr. W. H. Huddleston continues his invaluable papers on the Yorkshire oolites.

THE POST-TERTIARY DEPOSITS OF CAMBRIDGESHIRE.—This was the subject of the Sedgwick Prize Essay for 1876, and was awarded to Mr. A. J. Jukes Browne, B.A., F.G.S. It is now published by Deighton, Bell, & Co., of Cambridge, at half-a-crown. As might be expected from Mr. Jukes Browne's known reputation as a writer and geologist, it is a most ably-written and attractive essay on the subject, presenting us with an account of the physical features of the county, and a description of the glacial deposits, the hill-gravels, the valley-gravels of the early river system and of the present river system; and also a general correlation of the drift beds of Cambridgeshire with those of East Anglia.

THE LATE PROFESSOR DAVID PAGE.—We regret to have to announce the death of this well-known geologist, on Sunday, March 9, at the age of sixty-five. Although not distinguished for discoveries in the field, few men have done more to make English geology so popular and extensively studied as Professor Page did by the numerous admirable books of which he was the author, and many readers will hear of his death with unfeigned regret.

THE GEOLOGY OF NORTHUMBERLAND.—Professor G. A. Lebour, of the Newcastle College of Physical Science, has just published a neatly got up *brochure* having the above title. It was intended originally for use in his own geological class, but there cannot be a doubt that it admirably fills a want, for we know of no trustworthy description of the geology of that part of England. The glacial beds are especially interesting, and the Permian, Carboniferous, Silurian, and Igneous rocks frequently occur under peculiar circumstances. On all these Mr. Lebour has written in a style at once accurate and readable. The book may be obtained of H. Sotheran & Co., 78 Queen Street, London, E.C.

CONODONTS FROM CAMBRO-SILURIAN, AND DEVONIAN STRATA IN CANADA AND THE UNITED STATES.—A paper on this subject was recently read before the Geological Society, by Mr. G. Jennings Hinde, F.G.S. After a sketch of the bibliography of the subject, the author described the occurrence of Conodonts. In the Chazy beds they are associated with numerous Leperditia, some Trilobites, and Gasteropods; in the Cincinnati group with various fossils; and in the Devonian strata principally with fish-remains: but there is no clue to their nature from these associated fossils. They possess the same microscopic lamellar structure as the Russian Conodonts described by Pander. The various affinities exhibited by the fossil Conodonts were discussed; and the author is of opinion that though they most resemble the teeth of Myxinoïd fishes, their true zoological relationship is very uncertain.

ANNELID JAWS FROM THE CAMBRO-SILURIAN, SILURIAN, AND DEVONIAN FORMATIONS IN CANADA, AND FROM THE LOWER CARBONIFEROUS IN SCOTLAND.—This was another paper read by the same author. After referring to the very few recorded instances of the discovery of any portions of the organisms of errant Annelids, as distinct from their trails and impressions in the rocks, Mr. Hinde noticed the characters of the strata, principally shallow-water deposits, in which the Annelid jaws described by him are embedded. A description was given of the principal varieties of form, and of the structure of the jaws. They were classified from their resemblances to existing forms under seven genera, five of which are included in the family Eunicea, one in the family Lycoridae, and one among

the Glycerea. The author enumerated fifty-five different forms, the greater proportion of which are from the Cincinnati group.

GEOLOGY OF ESSEX, &c.—We have received one of the "Memoirs of the Geological Survey," giving an explanation of sheet 27 of the one-inch map of the Survey of England and Wales. It deals with the Geology of the north-west part of Essex and the north-east part of Herts; with parts of Cambridgeshire and Suffolk. The survey is under the direction of Mr. W. Whitaker, with whom are associated Messrs. W. H. Penning, W. H. Dalton, and F. J. Bennett. Not one word of commendation on our part is needed to introduce this *brochure* to our readers, but we are glad to call attention to its issue, nevertheless.

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—Your correspondent, Mr. H. D. Barclay, in the January number very truly and properly remarked that "the great difficulty in the investigation of the minds of animals appears to be that man, instinctively and unconsciously, unless checked by reflection, explains their actions by his own modes and laws of thought." This appears to me to contain the whole gist and difficulty of the subject, if he means, as I understand it, that the unguided impulse of man is to draw instant conclusions (if I may say so) of the cause of actions in animals by analogy to the cause which would have actuated him under like circumstances. If it could be proved that we were justified in so concluding, the hypothesis that instinct and reason are different only in degree would be sufficiently substantiated, but as yet nothing worth the name of proof has been offered, and I believe it to be incapable of proof for the simple reason that the opposite proposition, viz. that we cannot judge by such analogy, is abundantly proved to every one having the most rudimentary knowledge of the actions of animals. We know that animals can and do do highly "reasonable" things intuitively and without reason and reflection, and that it is necessary to the order of their existence, but the very opposite of this holds good with reference to man; he cannot do reasonably anything without reasoning and reflection, and these faculties are just as necessary in him to the order of his existence, as they are unnecessary in animals to the order of theirs.

Take for instance such actions of animals, as birds building their nests, young birds opening their mouths to be fed, the admirable way in which they keep their nests clean, the hen warning her chicks of the presence of the hawk, the chicks flying to their mother for protection, young ducks taking to water, &c. These instances are sufficient to effectually negative the proposition that we are to judge of the actions of animals by analogy with the same laws that govern the actions of man. If not, where is the analogy in these cases, and if in these cases we cannot so judge why are we to do so in others? Or, in other words, if we are to judge of some of the actions of animals by the law of pure instinct as differing in kind from reason, where are we to commence to judge of them by a law of instinct not so differing; or again, the above instances proving, as I believe they do, that there is an instinct differing in kind from reason, are we to believe that animals are

endowed with both faculties, whilst we know man is not; and again, if the difference is only in degree, how is it that as animals have been born in the higher degree, i.e. with power to act "reasonably" from the beginning of their birth, and thus having an immense advantage over man at the starting of life, they are so immensely inferior to man, who in comparison is born into the lowest degree? Taking the difference as being in degree, then comparing man with monkey, the highest degree is in the monkey. The uncultured man is shown by Darwin's savage to have less reason than the uncultured monkey; this theory therefore would compel us to trace the degree in man *downward* from the monkey, though this is hardly in conformity with the theory of evolution.

As it is capable of proof that animals can act intuitively with sufficient apparent "reason" for their wants, and, as compared with man, are incapable of tuition, and that man cannot act at all intuitively, but, as compared with animals, is capable of tuition to an unlimited degree, it appears to me to be a fair deduction that the respective powers of "reason" as actuating man and animals are of so totally different a nature as to be no more the same in kind than a man is a species of duck because he can learn to swim.

The incident of Darwin looking with abhorrence on the savage of Tierra del Fuego, and comparing him (the savage) unfavourably to a monkey, rather than being a proof of the sameness of mind and instinct, is a good illustration of the difference of those faculties. Look on this picture: Darwin, a man, born with no instinct, as far beyond the monkey (who was born a thousand times cleverer than he was) as the stars from the earth. Then look on that: the savage, a man beneath the monkey, simply because he was born without instinct, but with a mind, which from degradation of his race he had not exercised. But he bears every impress of the aptitude and attributes of man, and as to mind, only differs in degree from Darwin. Compare them, and then compare the savage and the monkey, and then see if we cannot get a true perception of what constitutes a difference in degree and in kind; if not, let us imagine a young savage and a young monkey put through a course of instruction, say in arithmetic, it would be an interesting study to watch which would learn the "tables" first; but I would back the savage. Yet, if we are to take the inferiority of state of the particular savage which Darwin looked on, as an instance of reason being of the same nature as the instinct of monkey, I should be backing at long odds.—*Robert S. Gilliard.*

INTELLIGENCE IN MAN AND ANIMALS.—I should like to make a few remarks on the above subject in reply to some of your correspondents, if you can afford me the necessary space. Mr. Barclay in his first communication, says: "If it could be proved that a dog deliberately chose one of two courses of action, the case of reason would be established." Now it seems to me that in their every-day actions, animals frequently choose one of two courses of action. For instance, if a cat is left alone in a room with a bird, its natural instinct would impel it to kill the bird and eat it, but it has reason enough to know that such a course of action would be followed by a certain punishment, the fear of which deters it from doing that which mere instinct would certainly prompt it to do. A dog knows very well when it has done wrong, and the old saying "Like a dog with his tail between his legs" is a very expressive one. It may, perhaps, be said, that the animal is simply restrained from doing a certain action by the fear of consequences. Is it not so with man? What would become of our boasted morality, the rights of property, &c., were it

not for the fear of consequences, here or hereafter? Mr. Barclay admits that animals possess what are called moral qualities in man, but denies to the unfortunate brute any praise for their possession, as they are simply a part of its nature, "primal impulses." If such be the case, how can the difference in the disposition of animals be accounted for? Some animals are born without those "moral qualities of fidelity, attachment, and courage," which, when found in the lower animals, Mr. Barclay designates "primal impulses," and seem to be actuated simply by an unconquerable animosity to mankind in general. I do not quite understand your correspondent, Mr. P. Q. Keegan, when he says: "that memory is an act of the intellect, but certainly not an act of reasoning in the sense of inferring one proposition from another." Memory is the power reason has of retaining and arranging facts which come under our observation, so that they may be used when required, but I certainly do not see how memory could possibly exist without reason, or reason without memory. Mr. Barclay admits that animals have some intelligence and memory, but questions their power of reasoning, which he says is the root of man's civilisation, and makes him a responsible being. Alas! that the power should be so perverted as it sometimes is! Has Mr. Barclay forgotten that there are various races of mankind, and that all are not quite so highly civilised as we are in this favoured country? Again, Mr. Barclay says: "Those who credit the lower animals with reason, if they are consistent, will also credit them with conscience." Why should they not be credited with conscience? As I have said before, most domesticated animals know very well when they have done wrong, and prepare to suffer for it, just as a naughty child would do. In conclusion Mr. Barclay says: "Take from man his reasoning power, latent though it may be in many cases, yet underlying all his conceptions, and we find the idiot who would perish but for extraneous aid. Take from the quadruped the modicum of reason which Mr. Darwin and others of his school attribute to it, and we have an animal endowed with some kind of intelligence we do not understand, but name instinct." Of course, just as the feeling of cold is produced by the absence of heat, so if you take away a man's reasoning power, you leave him a helpless idiot, without even instinct, and if you take away the modicum of reason from the quadruped (which Mr. Barclay denies it) you leave what may be called simple instinct. Mr. Barclay seems to contradict himself in his last sentence. The remarks of your correspondents A. Wheatley and C. L. W. are very good, and much to the point, but "Idea" seems to take a poetical rather than a scientific view of the subject under discussion. The idea that animals really possess something more than mere instinct, and are deserving of more consideration than they generally receive, is certainly gaining ground amongst the thinking portion of the community, and to use the words of Mr. P. Q. Keegan, is seriously entertained "by men of the highest culture and sanity."—*A. C. Rogers, Southampton.*

INTELLIGENCE IN MAN AND ANIMALS.—Allow me to correct two slight errors in my note in your April issue. After the word "effect," the colon should be changed to a full stop, as the words "to this effect" refer to the "supernatural change" previously mentioned. Also "Lopinard" should be "Topinard." Your correspondent, Mr. Barclay, says that the nature of the lower animals obviously differed from ours. But this is not certain, excepting that ours is perhaps more perfect. Animals show joy, fear, hunger, pain, will, choose larger of two pieces

of food, &c. These are also parts of our nature ; we have not the privilege of folly even ; nor of language, for animals certainly have some kind of language of their own. I will however return to this point afterwards. Even morals are but the rules of society adopted by certain people, and are not everywhere the same. But "le chien sait que pour ne pas être mordu il ne doit pas mordre, et agit en conséquence ; il a aussi sa morale" (Topinard). Now in the above and similar cases, if our actions are supposed to result from reason, why not those of animals ? The effects in animals are much the same as in ourselves, why not the causes ? If in similar actions in each case, we adjudge reason to be exercised in ourselves, we cannot, I think, consistently deny such power to animals. Again, Mr. Barclay says that if we take from man his reason, we leave him an idiot, but if we take from the quadruped the modicum of reason attributed to it, we leave it endowed with the same intelligence, which we do not understand but call instinct. Now memory cannot be called instinct. If we take memory from man we certainly detract from his intellect ; if we take it from animals do not we lower their intellectual powers also ? Some savage tribes have very little intellect ; there are some who cannot count more than two, while a magpie has been known to count three. I do not mean merely to repeat the numbers, but to understand them. Monkeys will organise bands, appoint sentinels, listen to speeches from their leaders for a very long time, and have been found to execute, occasionally, careless sentinels ; is there no reason about this ? It is absolutely necessary to keep poetry, sentiment, &c. out of such questions as this, and to reason merely from known facts. It is often supposed that man alone had reasoning power given to him, and it may be very pleasing to our vanity to think so. The older naturalists imagined that man and animals were totally different, but has it not been shown that they are really only different branches of the animal creation ? Philology may throw some light on this question. It is usually admitted by philologists that man invented language. Now, beyond all doubt, the earliest languages were very rudimentary and imperfect, consisting of mere ejaculations. The great reasoning power of men of the present time is in part due to language, a medium in which to think. But when language was so imperfect, thought must also have been rudimentary. Now is it beyond probability that the first inventors of articulate speech had not much more reasoning power than that shown by apes ? Apes have the vocal organs of man, but have not yet learned to use them as we have. Consequently one of the greatest aids to thought is undeveloped in them. It has only arrived at its present state of perfection in man during many thousands of years.—*A. Wheatley.*

INTELLIGENCE IN ANIMALS.—When I was a young man I lived in chambers on the ground floor of No. 1, King's Bench Walk. As the ante-room was dark, glass had been let into the upper part of the front door. This made it necessary to place the knocker lower than is usual. A fine tom-cat was my constant companion. As a knock at the door was a very welcome sound to me, from the hope it excited of a possible client, I was very prompt in answering the summons, for I had not then a clerk. My cat had thus the opportunity of observing (whether he did so in fact is of course the question) that the opening of the door immediately followed as a consequence on the agitation of the knocker. Certain it is that tom on returning from his nocturnal rambles would stand on his hind legs and with his fore paws raise the

knocker and produce as decided a succession of raps as a human being could have given. I was generally in bed when this occurred and was often unwilling to get up to let the truant in. If I remained long obdurate he would go round by Whitefriars (how he left the Temple I do not know, as the high gates were closed) and passing down a lane would climb a wall into a garden. By this circuitous and difficult route he obtained access to my bedroom window. There he would make such a mewling and scratching on the glass that I was compelled for peace' sake to rise and admit him. I am afraid that I did not always receive him with the welcome which his intelligence and perseverance deserved, but we were soon good friends again, and it was with great regret that I found on my return from a long vacation trip that my cat had disappeared. It must be admitted that the behaviour of the animal was as if he had reasoned thus. "My master does not hear the knocking because he is in bed ; I must therefore go round and rouse him by making a noise at his window." Some years ago I told this story to a very eminent judge. With a twinkle in his eye he said, "I also had a remarkable cat, she would sit on my table as I read my briefs and play with the paper, and when my eye approached the bottom of a page I could almost fancy that she tried to turn it over for me with her paw." This satire on my story and the inference I was disposed to draw from it, has made me hesitate to tell the anecdote except to a sympathising audience, but as you are receiving contributions to the subject of intelligence in animals, I think it due to the cats to put it on record in your columns, as one for the exact truth of which I am willing to be responsible ; with this object I give my name.—*James Hannen.*

INTELLIGENCE IN THE DOG.—I have read various notes under the head of "Intelligence in Animals," which have appeared in *SCIENCE-GOSSIP*, and am induced to jot down a few particulars respecting a sheep-dog of mine, leaving your readers to determine the motive power that influences the animal, for I will not offer an opinion as to whether instinct or reason guides him. He is very fond of a long walk, and when I first came to live here used to accompany me to the post office, but the distance being trifling, he soon refused to go with me whenever he saw any letters or papers in my hand, and it is quite sufficient now to say, "I am going to the post," to prevent his showing any desire to accompany me when I leave the house. He goes every morning into the lower end of the village with an elderly gentleman to fetch the daily papers, and having discovered that a young lady, a friend of mine, takes her morning's walk about eleven ; he now returns from the village, leaving Mr. B. at the stationer's in time to meet Miss R., thus securing for himself two walks. He never tries to accompany any of the family who are going to church ; it is quite sufficient to say "Sunday," or "church" (he was once turned out of church) ; but if I am at home, and happen to go for a walk during the hours of service, his delight is excessive. He barks invariably as we pass the church.—I cannot break him of the habit—as if to say to the others who are in church : "I am going out, though you would not let me come with you." He sleeps in an unused coach-house, is fed once in twenty-four hours. When he is locked-up for the night, all the larger bones which he is unable to eat, he, after picking clean, carries off to a corner of the building far away from his bed and lays in a tidy heap.—*Mrs. Alfred Watney.*

PRIDE OF A COW.—It is tolerably well known that when milch cows kept on a farm are being driven out to grass, and when brought home to milk,

the oldest cow always places herself at the head of the herd, and so on, according to their ages, when the youngest comes last. But I think it will rarely occur that this assertion of pre-eminence over the herd is ever carried to such an extent as appears in the following instance. A person states that when on a visit to a country house where cows are kept, it one day happened that he was passing the cow-house just at the time when the dairymaid was driving home the cows to be milked. They all passed in quietly enough, with the exception of one, which stood lowing at the door, and resisted every effort of the dairymaid to induce her to enter. When the maid was interrogated as to the cause of this obstinacy, she attributed it to pride; and when surprise was expressed at this, she explained that whenever any other of the cows happened to get in before her, this particular cow would seem quite offended, and would not enter at all, unless all the others were turned out again, and she had an opportunity of walking in before them. This statement having excited curiosity, and a wish to ascertain its accuracy, the maid was desired to redouble her exertions to induce the cow to enter; on which she chased the animal through every corner of the yard, but without success, until she at last desisted for want of breath, declaring there was no other remedy than to turn out the other cows. She was then permitted to make the experiment; and no sooner were the others driven out, than in walked the gratified cow, with a stately air, her more humble-minded companions following meekly in her train.—*Dipton Burn.*

LABURNUM IN AUTUMN.—There are several laburnums here which exhibit the peculiarity mentioned by W. G. I am not botanist enough to say whether they differ from the ordinary variety, but do not think so, as they exhibit no other mark of difference. The second flowering occurs every year in the autumn.—*J. Forbes Mitchell, Thainstone, N.B.*

LABURNUM IN AUTUMN.—I noticed that the flower pendants of the laburnum blossoming in September were smaller than usual, and it may probably have been the variety referred to by your correspondent.—*R. H. Nisbett Browne.*

QUERY AS TO FLOWER.—It seems obvious that in the lines from "Venus and Adonis," referred to by Mr. J. Wheldon, jun., the poet had in his mind the mythological story concerning the death of Adonis. *Cynaras juvenis* (Adonis) having died from a wound received from a boar, the flower anemone sprang from his blood. It is not likely that Shakespeare here refers to any other flower. Buchanan, in his "Dictionary of Science and Technical Terms," points to *Adonis autumnalis* as the plant deriving its name from Adonis. This plant being of the same order (Ranunculaceae) and somewhat resembling the anemone, might have easily been called in common with it.—*Charles F. W. T. Williams, Bath.*

QUERY ABOUT FLOWER.—In Bell's edition of Cowley's Poems (1778), book iii. of Plants, p. 147, stanza 610, the purple anemone is spoken of as the flower stained by the blood of Adonis.

* Anemone her station took

The purple, with its large and spreading leaf,
Was chosen, by consent, to be their chief;
Of fair Adonis' blood undoubted strain,
And to this hour it shows the dying stain."

I have also seen this legend mentioned in another book.—*F. L. St. A.*

QUERY AS TO FLOWER.—Mr. J. W. Wheldon, jun., asks what flower does Shakespeare refer to in the closing stanzas of "Venus and Adonis."

"A purple flower sprung up, chequered with white."

I think he means the Pansy, and if he will refer to "A Midsummer Night's Dream," and read the exquisite passage descriptive of Love in Idleness, beginning,

"I remember

That very time I said, but thou couldst not,"

he will see the reason for my opinion. In Singer's "Shakespeare," the editor says in a footnote, "The tricoloured violet, commonly called pansy, or hearts-ease, is here meant." It has other fanciful and expressive names, such as "Cuddle me to you," "Three faces under a hood," "Herb Trinity," &c. Is there a description in all literature that can compare with this of a simple flower?—*H. D. Barclay.*

QUERY AS TO FLOWER.—With reference to Mr. Wheldon's query as to Flower, I would remark that anemone is supposed to be the name of the flower as the one into which Venus was said to have changed Adonis. See Ovid. *Metamorph.* l. 10, p. 735; but classical authorities might here render some solution. There is *Anemone Pulsatilla*, or Pasque Flower, with fine purple flowers; and other species of Adonis, all belonging to the Ranunculus family—these latter have, according to Mr. Bentham, mostly red or straw-coloured flowers; then the pheasant's-eye comes under this head; the same author states that a variety was formerly much cultivated in gardens under the name of *Flos Adonis*. During a residence of some weeks in Rome in the spring of 1865, I noticed thousands of anemones with red flowers in the extensive grounds of the nobility, forming a carpet of scarlet colours. Dean Stanley in his work on "Sinai and Palestine," writes, "that in the spring the hills and valleys of Palestine are covered with thin grass and aromatic shrubs which clothe, more or less, all Syria; they also glow with a blaze of scarlet, of all kinds, chiefly anemones. Of all the ordinary aspects of the country, he writes, the blaze of scarlet colour is perhaps the most peculiar, and to those who first enter the Holy Land it is no wonder that it has suggested the touching and significant name of 'the Saviour's blood drops.'"—*John Colbrooke.*

"HONEY-STALKS?"—In Shakespeare's "Titus Andronicus" occur the words:

"Words more sweet, and yet more dangerous,
Than baits to fish, or honey-stalks to sheep."

Query, what are "honey stalks?" Perhaps some of your readers may be able to inform me.—*C. Foran.*

DOGS AFFECTED BY THE SOUND OF MUSIC.—What is the explanation of the curious effect that music (played upon a piano, &c.), has upon some dogs? I have a skye terrier about four months old, who, when the piano is played, seems to be curiously fascinated by the sound, and comes towards it, but then howls in a most plaintive way with his nose in the air, as if protesting against the sound.—*W. Stavenhagen Jones.*

COSSUS AT SUGAR.—In the month of September, 1877, while at Somersham (Hants) a specimen of *Cossus ligniperda* came to sugar. It rather surprised me, as I thought this species did not come to sugar. If any reader of SCIENCE-GOSSIP can answer this for me, I shall be much obliged.—*W. H. Newberry.*

FEEDING BULLFINCHES WITH HEMPSEED (p. 66).—Having had several of these birds in keeping, I am able to testify that hempseed has no very notable effect in darkening the plumage, nor does it appear to shorten their lives, as has also been insinuated; not that it is advisable to confine them solely to hempseed, I have generally mixed equal proportions of crushed hempseed and canary-seed, adding each day a little millet or maw-seed. Rape would probably be unwholesome to them. It is difficult to break them from the hempseed if they have once been allowed to have it as part of their diet, I have seen them pine under such an attempt. As the bullfinch is naturally rather a greedy bird, it is well to check caged birds if inclined to over-feed, especially when green food cannot be got as a corrective.—*J. R. S. C.*

PARROTS AND THEIR EGGS.—I have been advised to write and tell you of a very interesting and uncommon occurrence. My old parrot was bought at Norwich in the year 1872; I believe she was then three or four years old. She was quite ill last week, and thinking she was moulting I kept her very warm, and when I left the room I covered her cage over; on my return from church last Friday morning, I found an egg in the cage; still she did not get better, and yesterday morning another was laid. The bird-fanciers assure me it was a very rare occurrence for two eggs to be thus laid, and that it ought to be put on record.—*E. J. B. W.*

YEW-TREES AND CATTLE.—With reference to the remarks in the March number of *SCIENCE-GOSSIP* as to the injurious effects of the foliage of the yew-tree on cattle, the following extract from the "Globe" of March 21 may be interesting: "Eighteen valuable beasts have died at Willington, near Eastbourne, in consequence of eating branches of yew-tree, probably through scarcity of ordinary green food."—*E. Lovett, Croydon.*

GOSSAMER.—A gentleman, a farmer in this neighbourhood, told me that while coursing last week he saw several fields of wheat and sainfoin that were smothered with gossamer. I myself saw a good deal floating about in the town, and noticed that instead of the clotted appearance it assumes in the autumn, it was in long fine threads. Would you kindly tell whether this is a usual occurrence in spring, and the cause?—*Arthur G. Wright.*

THE NAME "PRIMROSE."—The editor of a scholastic journal has recently stated, in answer to a query, that the word "primrose" is a corruption of *primerolle*, a French word, introduced by our early authors. I should be glad to know if this is probable, for I have heard also the assertion that our forefathers called this flower of spring the "prime-rosy," because it was one of the first to appear in the season, "rose" being by them used with some latitude, and applied to various flowers besides the rose proper.—*J. R. S. C.*

CAN WORMS CRAWL BACKWARDS?—Mr. J. G. Wood, in a recent article on the common earthworm written in a popular periodical, states that the worm is so formed that it is impossible for it to crawl backwards. I am sorry to contradict so distinguished a naturalist, but scientific facts do not bend to great names, and I beg to say that worms *can* and *do* crawl backwards. It is an unusual method of progression or retrogression I allow, and is not to be confounded with the sudden jerk by which they start backwards into their holes, but that worms can strictly and literally crawl backwards when excited by circumstances so to do, I have had ocular demonstration on two particular occasions—once when attempting

to induce a large worm to crawl into a small glass tube, which I persistently placed just in front of it when it began to crawl; irritated apparently by a foreign substance being so frequently brought into contact with its attenuated head, all at once the worm began to crawl backward on the ground for a space of four or five feet and at a rate equal to about two-thirds of its ordinary forward pace when progressing. On another occasion I was attempting to make a worm crawl along a path in order to calculate the time-rate at which a worm can crawl in a mile. The worm persistently attempted to crawl to the side grass instead of along the path and to prevent it I continually touched its head with a little stick, when this worm also apparently annoyed by such constant tapplings on its head, began to crawl backwards a short distance on the path. Perhaps some of your readers can confirm this statement.—*W. Budden, Ipswich.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish *SCIENCE-GOSSIP* a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

D. B. (Dudley).—It is very difficult to speak only from leaves, they are so much alike, but we believe it is a *Musa*, perhaps *M. sapientum*. Berkeley's 'Cryptogamic Botany' is published by H. Baillière, 219, Regent Street, London.

T. O. BRAITHWAITE.—We do not remember receiving the larvae of which you speak. Can you send us other specimens?

W. A. DURNFORD (Barrow).—You will find full details as to aquarium management, and the manufacture of artificial sea-water in "The Aquarium: its history, structure, and management," by J. E. Taylor. London: Hardwicke & Bogue, price 6s.

E. B. DE M.—See reply concerning marine aquaria above. We have no doubt you can get materials for making artificial sea-water, gravity-beads, &c., at Mr. King's, Sea Horse House, Portland Road, London.

W. E. MILNER.—The last edition of White's "Selborne," in 2 vols., edited by Professor Bell, who lives in White's old house, is by far the best yet issued.

A. BENNETT.—We believe yours is the only parcel which got wrong out of all our Botanical Exchange Club deliveries. We will see that you are righted.

M. H. ROBSON.—We do not remember having seen the flagellum of *Euglena viridis* terminating in a bulb before. The specimens you sent reached us alive, and we observed that the bulb was used occasionally as a kind of sucker against the glass sides of the zoophyte trough.

E. DICKSON.—One of the best books we can recommend to you is Penning's "Field Geology," published by Baillière, at (we believe) 5s. We are afraid there is no other way of naming your fossils than by comparing them with some museum specimens, or else borrowing the volumes of the Palaeontographical Society, or such works as Professor Phillips' "Geology of Yorkshire."

T. G. H.—See reply to query as to the nature of the specks on the Seville oranges in April number of *SCIENCE-GOSSIP* under Notices to Correspondents, p. 95, in answer to "G. R. B. (Shoreham)." Get Oliver's "Botany," published by Macmillan, at 4s. 6d., and work well at it. All will come right. Thanks for your interesting specimens.

W. G. (Tuxford).—The specimens sent are all sulphate of barytes, or "heavy spar." Get Rutley's "Study of Rocks," price 4s. 6d.

GEORGE HASTWELL.—The fungus is *Peziza acetabulum*. We have carefully examined your fossil from the Millstone Grit, but do not think it is an organic remain, but possibly one of the numerous surface-markings we often get in beds deposited in shallow water.

J. M. CAMPBELL.—Your zoophyte is *Sertularia operculata*. **GEORGE TURVILL.**—We have received the slide. The specimen mounted is the flea of the mole, the largest known to affect any animal in Great Britain. Its name is *Pulex talpa*, derived from the animal on which it is parasitic.

GEORGE LINTON.—Your specimen is an echinoderm, shorn of its spines, known as the common heart urchin (*Amphidotus cordatus*).

EXCHANGES.

WELL-MOUNTED slides of pigeon despatch, used during the siege of Paris, in exchange for two slides of interest, also well-mounted.—L. Hawkins, Hillside, Hastings.

WANTED, good slides, in exchange for well-mounted slides of "Challenger" sounding.—H. R. 85 Worcester Street, Higher Broughton, Manchester.

WANTED, the second volume of 'Recreative Science.' Any one having a copy for disposal will oblige by addressing (stating price) as above.—Charles Butterworth, 88 Sandy Lane, Shaw.

WANTED, named teeth of fish from Old Red Sandstone of Scotland; interesting objects given in exchange.—W. H. Harris, 44 Partridge Road, Cardiff.

DREDGING. A gentleman who is going on a dredging cruise round the British Isles during the ensuing summer will be glad to hear from any one willing to accompany him.—C. P. Ogilvie, Sizewell House, Leiston.

CORRESPONDENCE and exchange invited during season with collectors having duplicate eggs of nightjar, less-potted woodpecker, dotterel, hawfinch, twite, &c., by R. Standen, Goosnargh, Preston, Lancashire.

WANTED, a good clean copy of the "Student's Manual of Geology," by J. B. Jukes, 3rd ed., edited by A. Geikie, Edinburgh, 1872; also Nos. 15 and 17 for October and December, 1876, of the "Naturalists' Tour of the West Riding, Consolidated Naturalists' Society," full price will be given in each case.—H. Crowther, the Museum, Leeds.

A GENTLEMAN slightly acquainted with geology, would be glad to correspond with another for their mutual benefit.—Address "J." care of Mr. Powell, stationer, Corporation Street, Manchester.

WANTED, Phillips' "Geology of Yorkshire." Send particulars of price to Harry Muller, Rawdon, near Leeds.

Good slides of diatom and globigerina ooze ("Challenger" dredging); also parasite from the gill of salmon, in exchange for other good slides.—Nicholas Wright, 8 Duke Street, Lower Broughton, Manchester.

SHELLS of *Haliotis tuberculata* for reptiles or aquarium objects.—Charles Foran, Marshfield House, Eastbourne.

FOR sections of tamus root, showing starch granules and raphides *in situ*, send really well-mounted slides to Thomas Shipton, Chesterfield. Lists exchanged.

FURZE mite (*Tetranychus ulicis*) a good supply of living specimens in exchange for one or two well-mounted slides of the same.—E. D. Marquand, Brockenhurst, Hants.

WANTED to exchange Roscoe and Schorlemmer's "Chemistry," for either of the following; Foxnes' "Manual," or Gregory's "Handbook of Chemistry," Hooker's "Student's Flora," or a powerful pocket lens, lens not to be worth less than 15s.—J. Pywell, 50 Wellington Street, Leicester.

A VALUABLE collection of British mosses (120 specimens) with notes, from herbarium of late W. Valentine, (offered for Cooke's "Handbook of Fungi.")—G. E. Massee, 8 West Grove Terrace, Scarborough.

ASARUM EUROPEUM, or *Asaralaca* (1129). Living specimens of this rare old British plant in exchange for native living plants of any of the following: 1610, 1611, 1613, 1615, 1621, 1622, 1624, 1625, 1626, 1630, 1631, 1636, 1641, 1642, 1643.—James W. Lloyd, Kingston, Herefordshire.

WANTED, 52a, 78 var, 129, 175, 250b, 251, 251b, 418a and b, 492, 501b, 503b, 630b, 651b, 675, 747b, 839, 486b, 853b, 861b, 927b, 966, 992b, 1020, 1026, 1046, 1139, 1139b, 1147b, 1237, 1312, 1484, 1520b, 1530b, 1533b and c, 1555, 1569a, 1582b, 1631, 1632, for other rare plants, or exchange lists.—G. C. Druce, Northampton.

DUPLICATES of fossils from Oolite and others for other fossils.—J. Purdue, Ridgeway, Plympton, Devon.

DRIED fronds of *C. fragilis*, *C. officinarum*, *P. vulgare*, *P. Dryopteris*, *P. calcareum*, in exchange for *P. alpestris*, *P. Lonchitis*, *L. cristata*, *L. amula*, *A. septentrionale*, *A. germanicum*, *A. marinum*, *A. fontanum*, *A. lanceolatum*, varieties or exotic.—John J. Morgan, Tredegar.

WANTED, Smith and Beck's "Popular Microscope," in exchange for first-class transparent sections of coal, plant or cash.—James Spencer, Salisbury Place, Halifax.

WANTED, a low microscope stand, with or without objectives, Continental model, Smith & Beck's "Economic," or Universal, or similar form; will give in exchange a triple-nose piece, slides, slide cabinets, dissecting instruments, an air pump and other microscopic requirements, and a little cash. Must be sent on approval, to J. A. Harrison, F.R.M.S., The Laboratory, 31 Scale Lane, Hull.

SPINES of ophiocoma, and plates of holothuria: two balsam-mounted slides for exchange. Send lists to J. B., 36 Windsor Terrace, Glasgow.

BOTANICAL specimens and aid offered in exchange for entomological.—3 Belmont Villas, New Brompton, Kent.

The following unmounted objects for exchange: British and foreign zoophytes, flowers of *Sparmannia Africana*, seeds of *Libertia ixoides* (a beautiful object), &c. Wanted, well-mounted micro slides, also British and foreign zoophytes, and alga for herbarium. Foreign correspondence wanted.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

DRABA AZOIDES from Pennard Castle; fossil ferns from Dean

Forest coalfields, in exchange for zoophytes and Chalk fossils. Wanted, book on British zoophytes.—A. Thomson, 17 Wynne Street, Liverpool.

WANTED, fossil clausilids and pupæ from Isle of Wight and Essex; also small ammonites and fossil shells from different localities. Recent shells given in exchange.—F. M. Hele, Fairlight, Elm Grove Road, Cotham, Bristol.

OFFERS in exchange (either in foreign land, or foreign marine shells, the former most acceptable) for any of the following British land and fresh-water shells, which I have duplicate specimens of at present—namely, *S. oblonga*, *Lim. involuta*, *L. Burnetti*, *P. ringens*, *V. pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, *V. Moulinsiana*.—W. Sutton, High Claremont, Newcastle-on-Tyne.

AUTHENTICATED side-blown eggs, swallow-tailed kite, lām-mergeier, African buzzard, Wasen chattering, and several hundred Indian species. Wanted, birds of Europe (Brec), or eggs in exchange.—Sissons, Sharrow, Sheffield.

Vols. 3, 4, 5, 6, 7, 8, unbound (clean) of the "Entomologists' Monthly Magazine" (Van Voort) for Newman's "British Moths," microscope, or offers.—R. Colbridge, 57 New Brook Street, Hull.

INTERESTING unmounted material, mostly marine, such as zoophytes, foraminifera, diatoms *in situ*, and otherwise, algæ, entomostraca, tadpoles of crustaceans, holothurian plates, sponge spicula, molluscan palates, &c. Wanted, class slides, photo lens, books on mollusca and fishes or cash if preferable.—T. McGann, Burring, Ireland.

WANTED, standard works on natural history, in exchange for fossils and algæ. A good copy of Goldsmith's "Animated Nature," coloured plates, 2 vols., well-bound for four dozen good micro slides.—165 Well Street, Birmingham.

AUCHMENUS PUELLIS, in exchange for other good local coleoptera. Address, J. W. Pickering, 161 Belgrave Street, Birmingham.

FOR piece of Chinese rice paper (pith of tree), send object of interest, to Mrs. Skilton, London Road, Brentford, Middlesex.

FOREIGN land and fresh-water shells wanted, in exchange for American or the rarer British species and varieties. Continental exchanges desired.—Edward Collier, 7 Dale Street, Manchester.

BOOKS, ETC. RECEIVED.

"The Chemistry of Common Life." By Professor Johnston. New edition by Professor Church. London: W. Blackwood & Sons.

"The Flowers of the Sky." By R. A. Proctor. London: Strahan & Co.

"Life and Habit." By Samuel Butler. London: Hardwick & Bogue.

"Microscopic Organisms found in the Blood of Man and Animals, &c." By T. R. Lewis, M.B. Calcutta.

"Certain Effects of Starvation on Vegetable and Animal Tissues." By D. D. Cunningham, M.B. Calcutta.

"The Science Index." January.

"Proceedings of the Chester Society of Natural Science." No. 2.

"Report of the North Staffordshire Naturalists' Field Club, 1878."

"The Forester. Nottingham High School Magazine." Easter, 1879.

"Entomological Papers." By C. V. Riley, M.A.

"Journal of Proceedings of the Winchester and Hampshire Scientific and Literary Society." Vol. iii. part i. 1878.

"Midland Naturalist." April.

"American Naturalist." March.

"Revue Mycologique." January.

"Feuille des Jeunes Naturalistes." April.

"Guide du Naturaliste." January.

"Le Monde de la Science et de l'Industrie." February.

"Canadian Entomologist." February.

"Boston Journal of Chemistry." April.

"Land and Water." April.

"Journal of Quekett Microscopical Club." No. 39.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—
E. J. B. W.—W. W. H. R.—D. B.—L. H.—E. D.—
J. F. R.—T. B. W.—T. W. H.—W. B.—H. M. J.—J. C.—
E. J. B. W.—E. L.—W. H. H.—C. P. O.—W. H. J.—
C. B.—J. R. S. C.—J. J.—Dr. P. Q. K.—J. F. M.—J. H. W.—
H. W. R.—A. G. W.—M. H. R.—E. R. P.—A. W.—T. G. H.—
F. L. St. A.—J. M. C.—W. G. T.—G. H.—J. C.—H. C.—
J. F. U.—J. P. G.—M. F.—T. B. L.—J. O. E.—W. A. D.—
W. E. M.—S. T.—C. F.—E. B. de M.—C. E.—T. S.—W. K.—
R. S. G.—J. S.—H. M.—J. P.—E. D. M.—R. S.—W. H. G.—
G. E. M.—J. W. L.—G. C.—D. J.—J. M.—J. C.—F. K.—
Sir J. H.—W. S. J.—J. B.—F. W. M.—Dr. M.—G. H.—
T. W. D.—M. L. T.—W. J. W. P.—B. W. M.—Dr. D. S.—
G. M.—T. B. L.—T. McG.—R. C.—J. W. S.—W. S.—F. M. H.—
A. T.—B. B. S.—H. P.—M.—J. S. H.—&c.

THE PREPARATION OF INSECTS FOR MICROSCOPICAL EXAMINATION.

[Continued from p. 103.]



AND now as to the question of staining. Some have strong objections to staining specimens, for they say that it merely makes the object prettier, and that the natural colour is destroyed. These objections are quite sufficiently answered by the consideration that staining does more than beautify an object,—details visible with difficulty or not at all in an unstained specimen, are easily seen in

one that is properly stained ; and why, after all, should a slide not be made as beautiful as possible ? As for destroying the natural colour, that is generally done in the ordinary process of mounting. I am therefore in favour of staining, if it be properly done.

The following are the stains which I use :—Dr. Beale's carmine fluid. The recipe for this may be found in so many books, that it is unnecessary to give it again. Aqueous anilin blue.—Dissolve ten grains of anilin blue in one drachm of spirits ; add half an ounce of distilled water, and half an ounce of glycerine, and filter : let the mixture stand for a week or a fortnight, and then pour off the clear fluid for use. Anilin blue in oil of cloves.—Dissolve five grains of anilin blue in half a drachm of absolute alcohol. Mix the solution with an ounce of oil of cloves, and filter it through blotting paper. Magenta fluid.—1. A few drops of Judson's magenta dye in water, to which a little glycerine has been added. This is chiefly for staining chitine. 2. A very weak solution of the dye in methylated spirit. This is for staining muscles.

Hæmatoxyline.—Boil some logwood in water until a strong infusion is made ; filter ; dissolve a quarter of an ounce of alum in an ounce of water ; mix, say twenty drops of the logwood infusion with about an ounce and a half of distilled water, and add enough of the alum solution to make the fluid a bright purple ; filter, and the stain is ready for use. With the exception of anilin blue in oil of cloves, which is rather expensive, all these fluids cost next to nothing.

No precise directions can be given for staining, because the process requires to be varied a little for almost every object, but a little information as to the various properties of the different fluids will be useful. Carmine fluid does not stain chitine in the least, but it is excellent for internal organs and muscular tissue. The only objection to it is that it will not keep more than a month. A solution of hæmatoxyline, of about one-fourth of the strength of the recipe given above, answers every purpose of carmine fluid. It is not such a pretty colour, but it will keep very much longer. Muscular tissue needs about half an hour's immersion in this fluid to stain it a nice colour. Hæmatoxyline, according to the recipe, stains chitine very nicely. The time required to colour the object properly varies from half a day to forty-eight hours.

Specimens stained with carmine or hæmatoxyline may be mounted in either glycerine or balsam, but those stained by any of the other fluids can be mounted in balsam only. Aqueous anilin blue is a very useful stain. It will stain chitine fairly well, but not when it is very hard, as in the barbs of a wasp's sting. It is good for such things as mites, flies' mouths, and especially for crustacea, such as entomostraca, woodlice, &c. Magenta will stain anything, but it has a special affinity for chitine. It is very soluble in alcohol, and specimens stained with it must be hurried through the alcohol into oil of cloves in a few minutes, or all the colour will be washed out. By taking advantage of its special affinity for hard chitine, a very beautiful and instructive double staining may be effected in this way. Use a watch glass for soaking the specimens in absolute alcohol : pour

the alcohol away and drop on a little of the oil of cloves anilin blue stain, and leave it not more than five minutes. The specimens must then be washed two or three times in benzine. The blue drives out the magenta from the membranous parts of the insect, leaving it in the chitinous portion: a red and blue specimen is the result. If the specimen be left in the fluid too long, the blue will be precipitated on its hairs. The specimen is not spoilt, for the precipitate may be immediately dissolved, by dipping the object into absolute alcohol. After this it can be replaced in benzine directly. It is magenta, and especially the oil of cloves anilin blue stain, that the natural oil of Canada balsam causes to fade; but, as far as I can see, after about fifteen months' trial, dammar has no effect on them, the benzine fixing them permanently. It is therefore better, as precautionary measures, not to use balsam for any stained specimens whatever, and to thoroughly wash them all in benzine before mounting them in dammar.

When it is desirable that any insect should be stained, in almost every case, the proper time or part of the mounting process at which to stain it is after the soaking in acetic acid.

None of the numerous soakings and washings in the processes described above is without its reason. To give the why and the wherefore of everything would take too much space, but, if any important washing be omitted, the slide will not turn out so well as it ought to do. It is a much less complicated matter to mount a specimen in reality than to read about it; but, to make the description as clear as possible, I give an abstract of the way in which three-fourths of insects may be mounted. The time needed for each stage of the process is noted.

No. 1. Soak the insect, or part of it, in liquor potasse until transparent enough. Boil in clean liquor potasse, ten seconds. Wash in distilled water.

No. 2. Soak in acetic acid, half an hour. Wash in distilled water.

No. 3. Stain, when necessary.

No. 4. Wash in spirits. Soak in absolute alcohol, three to ten minutes.

No. 5. Soak in pure oil of cloves, five minutes, or in anilin blue oil of cloves three to five minutes.

No. 6. Wash in benzine. Wash in perfectly clean benzine [if stained].

[Specimens may be kept in benzine for a long time without injury.]

No. 7. Mount in dammar or balsam.

None of the other processes have so many stages as this.

I will now briefly detail for what kinds of insects the various processes are suited, but it is obvious that under this head only the most general directions can be given.

Whole insects look best in cells in glycerine, or, if opaque, in water, and some may be mounted dry; these media, as I have said above, are not intended to

display every detail, but only to give a general idea of the object. If the insect be rare, so that the mounter has no specimens for dissection, some of its beauty must needs be sacrificed by the potash and balsam process, supposing that it is particularly desired to make out some detail, and at the same time, to mount the specimen whole. I venture to think that no insect larger than a house fly should be mounted whole. Those wretchedly flat things, which are only fit for magic-lantern slides, such as whole garden spiders, butterflies, or even humble-bees, are my peculiar abomination. I have seen a great many of these "whole insect slides," some by [so-called] "first-rate mounters," but in none of them yet have I seen the features which make an insect beautiful on the one hand and interesting on the other, at all nicely shown. In attempting too much everything is lost.

Almost all dissected parts of insects may be mounted in balsam by process 1. Only transparent specimens should be stained. Double staining is especially suited for the following sorts of objects. Bees' and wasps' mouths and stings; gizzards (these doubly stained are extremely beautiful); spiders' feet; the mouths of most insects; mites of the family Trombidium; in fact, all parts of insects in which there is much soft membrane and a little hard chitine. For transparent ants and flies, and for such mites as cheese mites, soaking in ether (process 2) is suitable. When small crustacea are prepared for mounting [if it is wished that the shells be softened], they must be soaked for a longer time in acetic acid than is necessary for insects. I find anilin blue the best stain for some, and hematoxyline for others.

I have endeavoured to describe as clearly as I know how my methods of preparing insects, and I am told that some of my slides are rather successful. I do not in the least pretend to entire originality. Some of the "dodges," to use a current phrase, "are my own invention," but very many of them are the ideas of others (as I consider) improved on. Those who wish to make good slides should aim to improve on the methods here given, and it is only by trying different processes and varying them on the same object that success is likely to be achieved.

Oxford.

H. M. J. UNDERHILL.

MY HEDGEHOGS.

IN May of last year, having become possessed of two hedgehogs, and as the hedgehog is an animal that I had heard so many idle stories about, and wishing to learn something about their history and habits, &c., I determined to keep them.

The first experiment that I made, was to duck them in a pail of water, in order that self-preservation might compel them to unravel themselves, so that I could inspect them properly.

My next move was to provide a suitable residence for them; this was done in the shape of an old box,

some wire being put in the front, and some hay placed in the bottom, which answered, although a little cramped for room, admirably.

About their food I was in great doubt. It would be impossible for me to provide a regular supply of frogs, snails, &c. However, as a substitute, I tried bread and milk, and as they did not eat during the day, I was in great fears lest they had died, or would not eat at all, and it was with a troubled mind that I took my departure from them that night. The next morning my fears and doubts were agreeably dissipated, by finding the tin empty. I then found that my charges were nocturnal in their habits.

Their staple food was a tin of bread and sweet milk, supplied every evening.

After a short time they left off their shyness, and I could handle them comfortably. One morning I brought home a handful of snails, which I had met with in my rambles and supplied these to them, when immediately they commenced to eat them, shells and all, from which I augured that they had excellent teeth. I next managed to supply them with a few frogs, which they relished exceedingly. I noticed that whenever the frog was put into their cage, the hedgehogs remained perfectly motionless until they got a favourable chance, when they made for one of the frog's hind legs.

One morning they were near killing a tame black-bird which had inadvertently hopped into their cage, but which was rescued in the very nick of time.

The place where I kept them was a small loft used by tinsmiths, and I was wont in the summer nights to allow them to ramble about, and the noise that they made scrambling over the cans, &c., after the mice was astonishing.

Some people suppose that their pace is slow; the pace of mine was quite the reverse, and they could run along pretty quickly.

They never hesitated about jumping from a height, in fact one of them deliberately and coolly threw itself down a twelve-foot ladder, bouncing off the steps like an india-rubber ball, and when it reached the bottom was making off, a proceeding which was promptly stopped on my part.

They were thirsty animals, always drinking whenever they could, so that I placed water in their cage every morning for their benefit.

As regards those old-woman stories circulated about the animal, it is needless for me to state that they are all fabrications. One night I gave them apple slices for the express purpose of trying them, and in the morning there was not a tooth print on them, in fact the only fruit mine ate were cherries.

Another calumny is their eating game birds' eggs. Now, one night I starved mine, giving them only a whole hen egg, and in the morning the egg was perfectly whole, not a bruise or crack on it.

Mine continued thus in the "even tenor of their way" till the latter end of October, when a change

was apparent. They got very fat and ate less, and finally went to sleep about November 1. I packed them in a box with hay. However one of them escaped and was not found till February 27. They both awoke on March 1, and I may safely say, that the one in the box did not receive a pick of food during the whole four months of hybernation. When they awoke they were very emaciated.

Their weights before the hybernation were respectively, 2lbs. 6oz. and 2lbs.; after, 1lb. 9oz. and 1lb. 8oz.; having lost 13oz. and 8oz. respectively. During the hybernation they remained rolled up in a ball, and their breathing was very loud and distinct.

But in a short time they regained their original plumpness, and are now fatter than ever. I am in hopes they will breed this year.

THE NEW FOREST.

By E. D. MARQUAND.

[Continued from p. 99.]

IT is not necessary to speak of the productiveness of the New Forest as an insect-collector's hunting-ground, since it is probably better known to entomologists than to any other class of naturalists. In a given area of country—say twenty miles square—the entomologist has decidedly an advantage over the botanist: the former may work the same district for a lifetime and every year find something new—while the latter has a *definite*, however *extensive*, number of plants to discover. Insects move; plants do not. A dozen close observers possessing the requisite knowledge might catalogue the entire flora of a district—phanerogamic and cryptogamic—in a few years, while the insect fauna would continually be receiving fresh additions from the neighbouring country, and so be practically inexhaustible. Of course, on an island—Guernsey or Jersey, for instance—both classes of naturalists would be on a par.

About fifty species of butterflies, out of a total of sixty-four for Great Britain, have been taken here, and I am happy to be able to record the occurrence of a very rare species which, as far as my knowledge goes, has not hitherto been taken in the Forest, or included among its indigenous species. This is the Bath White (*Pieris daplidice*), a fine specimen of which I captured on June 12, 1876, in an open wood not far from Lyndhurst; it is now in my cabinet. Singularly enough, four days afterwards I saw another specimen in my garden flying to heliotrope; it alighted two or three times, but as I had no net it escaped. *C. alusa* was out in great force here in 1877; they first appeared on June 4, the date on which they seem to have occurred nearly all over the country. In July they disappeared, and the second brood came out on August 10, continuing till after the middle of October. *C. hyale* is rare, and so is

A. cratægi. *L. sinapis* may always be had by those who know where to go for them, for they do not wander far from their haunts, though less strictly local than *A. Galathea*, for which I know two stations, widely apart. The little Duke of Burgundy Fritillary (*N. lucina*) I have seen and taken, but not in such numbers as I did some years ago at Selborne. *G. c-album* occasionally appears, but I never saw it. The large Fritillaries and *L. Sybilla* are very abundant in all the large woods.

As every one knows, these are the headquarters of the two splendid Red Underwings *C. nupta* and *C. promissa*, perhaps the most beautiful moths which

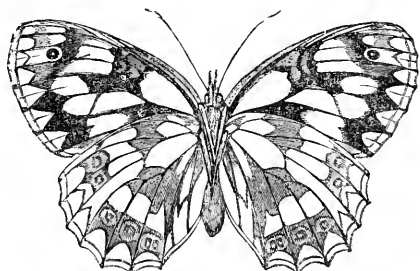


Fig. 102.—Marbled white (*Melanargia Galathea*).

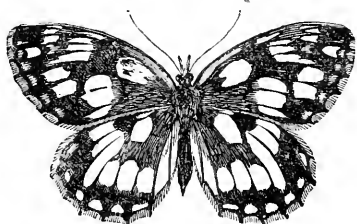


Fig. 103.—Marbled white (*Melanargia Galathea*).
Upper side.

the collector can hope to take away, unless they yield the palm of beauty to the lovely green *D. Orion* or the fine black and yellow *A. villica*, of which I once netted a variety with almost spotless hind-wings. Two years ago I captured a female *E. russula*: the males are tolerably common, but the other sex is, I believe, usually considered a great rarity. *S. fuci-formis* is usually abundant just for a short season, frequenting rhododendrons. The splendid Emperor Moth (*S. pavonia*) occurs in plenty, but is easier to rear from the larva than to catch on the wing. I have seen the perfect insect as early as April 18; and I once collected in a thorn hedge, and subsequently reared the large smoke-coloured caterpillars of the odd-looking Lappet (*G. quercifolia*). *E. Jacobææ* is a perfect pest, especially in the larva state, swarming in masses on Ragwort. *F. pinivaria* abounds in the fir plantations, together with the speckled *V. maculata*. It would be a needless occupation of space to enumerate even a tithe of the good moths that occur. Suffice it to say that at least three-fourths of the British macro-lepidoptera have been taken here.

If the New Forest is a favourite hunting-ground

with lepidopterists, it is scarcely less known to beetle collectors, and the coleopterist must possess a very fair collection indeed who can spend a week here without adding something to it. *Carabus nitens* is occasionally found on moist heaths, but by no means so plentifully as one would be led to suppose from books; much more common is the brilliant *Pecilus cupreus*, which it somewhat resembles. The great stagbeetle abounds, and now and again one comes across its smaller relative, *Dorcus parallelipipedus*. Once it was my good fortune to come upon a dead specimen of the giant longicorn (*Prionus coriarius*), a most noble fellow, formidable even in death. The Rhynchophora are probably very numerous here; *Ilyobius abietis* was extremely abundant two years ago. I used to find them in all sorts of odd corners in and out of the house; since then I have not seen more than a couple. The large and handsome *Cleonus nebulosus* has come under my notice once or twice, together with the little grey *Grouops lunatus*. *Cryptocephalus sericeus*—brilliant silky green—occurs in the flowers of *Hieracium*



Fig. 104.—Duke of Burgundy Fritillary (*Nemeobius lucina*).
Under side.



Fig. 105.—Duke of Burgundy Fritillary (*Nemeobius lucina*).
Upper side.

pilosella; *Coccinella 12-punctata*, abounds on the coast, and so does *Opatrum sabulosum*; and among young oaks in the forest I have occasionally seen the handsome scarlet Skipjack, *Elatér sanguineus*, flying in the hot sunshine.

We have two very elegant members of the ceropidae: *Cercopis sanguinolenta*, with black and crimson elytra, and a smaller bright green, and I fancy local, species—a *Jassus*, perhaps—which I found in abundance in sweeping the marshy border of a wood. Dragon-flies are numerous, both in species and individuals. By-the-by, if some one acquainted with our British neuroptera—the *Libellula* section—would send to SCIENCE-GOSSIP a synopsis of genera and species, I am sure it would be regarded as an act of kindness.

The Forest-fly (*Hippobosca equina*) is one of the features of the district. Thick, black masses of these repulsive insects may be seen on every horse and cow; and while the native cattle, "to the manner born," treat them with supreme indifference, a strange animal is driven frantic at the approach of one. Can any one tell me why? It is generally supposed that their food is the blood of the cattle they infest, but the organs of the mouth, which are of extreme simplicity, seem singularly incompetent to pierce the hide of a horse or cow. The impression among some of the people here is that they pull out the hairs and

suck the root bulbs. In favour of this view it may be noted that no wound or blood is ever observed where these flies have congregated. Perhaps some of the readers of this may be able to throw light on the subject. By the way, these flies are exceedingly difficult to catch, and cannot be killed by a blow. I have seen a man's fist brought down on one with a force almost sufficient to crush a stagbeetle; the fly gave a little buzz of contempt, and flew to the window. In flying their hum is scarcely audible, and they alight on the face or hands without being felt. They walk sideways, like crabs. Much hand-

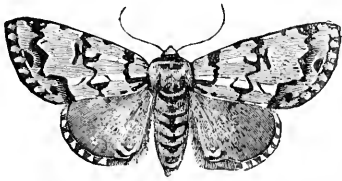


Fig. 106.—Scarce Merveil-du-Jour (*Diphthera orion*).

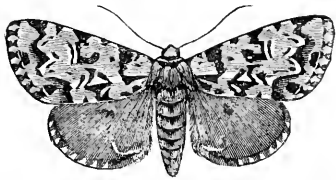


Fig. 107.—Variety of Merveil-du-Jour (*Diphthera orion*). See Newman's "British Moths," page 248.

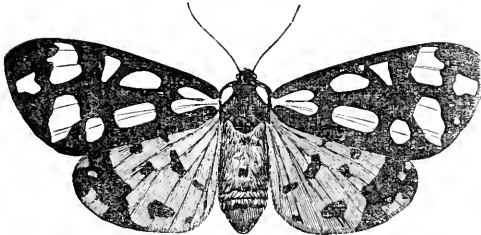


Fig. 108.—The Cream-spot Tiger-moth (*Chelonia villica*).

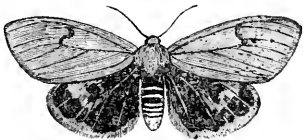


Fig. 109.—The Clouded Buff-moth (*Euthemionia russula*). Female.

somer insects, though certainly more ferocious and formidable, are the *Tabani*, of which we have several species. Collectors are well aware of their blood-thirsty propensities; the bite of the little grey *Hæmatopota pluvialis* is sharp enough, but woe betide any one who gets a nip from that sanguinary monster, *Tabanus bovinus*. His loud, booming hum is not to be mistaken, but his bite is something to be remembered. I captured a couple while they were

busy driving their lancets into the nether garments (fortunately thick ones) of a companion.

During last summer I took on the flowers of a water-mint a very curious insect—apparently a bee or ichneumon-fly—but it was remarkable by the entire absence of even the rudiments of wings. A brief description, abridged from my journal, may enable some one to identify it, in which case I shall be thankful for the name and any information about it, as I have never heard of apterous bees. Length, half an inch; head, antennæ, and legs, black; eyes, small; ocelli, none; thorax, bright chestnut-brown, with parallel sides, sloping beneath, *without traces of wings*; abdomen wasp-like, black, with three narrow bands of pale golden silky hairs: apex of abdomen acute and incurved.

Before passing on to the botany of this district I wish to say just a few words on two sections to which I have not been able to give much attention, though I have collected and noted a good number of species. First, the arachnida—or rather, I should say, the araneidæ. *Atypus Sulzeri*, our British *Mygalæ*, is probably a rare spider in the Forest, at least in those parts with which I am familiar, for only one specimen, a male, has come under my notice. *Lycosa andrenivora* is very common on our heaths, and so is *Tetragnatha extensa*, with its long legs stretched out in a straight line in the centre of its web above a little stream or pool. *Epeira umbratica*, "a spider of most villanous aspect," I have found in old posts, and a pretty variety of *Thomisus abbreviatus*, of a pale rose-pink colour, without a shade of yellow; this took on heath blossom, the hue of which it closely approached—another instance of insect mimicry.

Among the mollusca I have to record *Clausilia dubia*—at least, such I take it to be. It measures eight lines, while our *C. rugosa* only averages five; besides which, it is very much larger in every respect. *Helicella excavata* is generally distributed, and, in some woods, as Wilverley, very common. *H. fulva*, also, I have found, and *Planorbis contortus* in some places abundantly. The minute bivalve (*Pisidium pusillum*) is very numerous, often in company with the delicate little *Carychium minimum*—a shell so tiny that one almost requires a lens to see it at all.

(To be continued.)

THE LOVES OF THE FISHES.

COLD-BLOODED creatures are commonly not credited with any great degree of moral excellence. The affections of parent and lover are usually supposed to be wanting, and the emotion of gratitude is probably never dreamed of in connection with creatures so low in the scale of creation. Nor probably is it right to invest them with any great degree of eminence in this particular. Nevertheless, however, it is a real fact that some fishes not only exhibit

unmistakable signs of the affections alluded to, but in one case—the pike—even gratitude seems to be manifested. My readers may possibly smile incredulously at the suggestion that any excellence of feeling can be associated with the “fresh-water wolf,” over whose cruel and remorseless jaws the Dantean epigraph, “All hope abandon, ye who enter here,” might fitly be written. Such, however, is the case.

As the warm spring weather approaches, and summer hastens to ensue, the pike seeks the convenient tributaries of the river, or the shallow and weeded parts of the lake wherein to spawn. At this time the males and females may be presumed to be separate and unmated. Guided by the reproductive instinct, however, they more or less quickly pair; and it is just prior to spawning that the delight which they experience with each other's society is most apparent. The female is generally larger than the male, and piscine caresses are mutually indulged in. I have frequently seen the male rub his mottled sides against his partner, and gambol and dash about as if to show off his glee and his prowess as a water athlete; and on one occasion I remember the caresses of a two-pound fish were so energetic as to completely force the female up on the sloping bank. I captured the fish and replaced her in the water at considerable distance, but the remorseful widower was in the neighbourhood where I had first seen them on my return, evidently waiting the return of his mate. Whether his patience was ultimately rewarded dependent saith not.

The pike is for the most part monogamous. An example of this is interestingly given by Mr. Manley in his “Fish and Fishing.” He says, “I was jack-fishing in the lake in Earl Fitzhardinge's park, and had left a paternoster for perch baited with gudgeon in the sluggish stream above the small bridge. On my return from a walk round trolling, I found I had to encounter a fine jack which had attached herself to the paternoster, and after no little trouble I landed my fish, which scaled over 14 lbs. In the same manner, and exactly at the same spot, just a week afterwards I took another—the gentleman fish this time weighing 13 lbs. I have no doubt that these were an engaged or rather married pair just at the commencement of their honeymoon, and that after the cruel (I have often thought since that it was very cruel) capture of his bride, the bridegroom, disconsolate, hung about the spot, and so came also to a miserable end within a few days of the decease of his wife.” That it is a very customary occurrence to secure a pair of fish from one spot no angler will deny. In fact, on taking a good fish from any particular spot it is a recognised plan amongst the brothers of the craft to try for the other fish. In lakes the pairing is certainly more noticeable than in rivers. Whether the fishes hunt their food in pairs as a rule I cannot say, but that they reside in contiguity is an indisputable fact. The ruff also will not

live singly in aquaria, but die off—at least this is my experience. Unhappily the jack does not exhibit much parental affection, for it is an indiscriminate cannibal, and perhaps the best bait for a large pike is a small jack.

Having thus shown that the character of this voracious fish of prey is of a somewhat lighter hue than generally supposed, perhaps the reader will be prepared to hear a further good trait, the existence of which is however indubitably more questionable than the former. I refer to the exhibition of that rarest of virtues in the genus *homo*, namely, gratitude. In order to justify the idea that *Esax Lucius* exhibits this noble quality, I must refer at some little length to another fish of widely different family—the tench. Now this fish is covered with a thick glutinous slime, which is supposed to be of such medicinal worth to the piscine tribes that at the “touch of tenches” wounds and other disorders that fish is heir to are instantly bettered, and if the contiguity of the fishes be preserved, are ultimately healed. It is a certain fact that trout are rendered healthier by the introduction of a tench or two amongst them, and I have known several instances of the growth of byssus being arrested on the advent of this “physician of fishes.” Camden asserts that this is the case with pike, and his language is pronounced with no air of hesitation, though he was probably not a naturalist. Speaking of Southwark he says, “Here have I seen the bellies of pikes which have been rent open have their gaping wounds presently closed by the touch of tenches, and by their glutinous slime perfectly healed up.” Of course this assertion may be taken with caution, but the concurrent testimony of many observers as to the healing power manifested by this fish must be in some sort accepted.

Now here comes in the gratitude of the pike, if the idea is not too pretty to be true. Be he ever so hungry he never takes a tench. Carp and all other fish he will eat incontinently, in fact nothing else from a red cork float to a baby, or from a Polish damsel's foot to a mule's nose, comes amiss to him, but a tench he will not touch. The following admirable verses state the matter better than I can :

“The pike, fell tyrant of the liquid plain,
With ravenous haste devours his fellow train,
Yet howsoever by raging famine pined,
The tench he spares—a medicinal kind;
For when by wounds distressed or sore diseased,
He courts the salutary fish for ease,
Close to his scales the kind physician glides,
And sweats a healing balsam from his sides.”

Who will now deny his pikeship the virtues I claim for him—conjugal constancy and affection and gratitude? By-the-by, speaking of tench reminds me that this fish is especially tumultuous in its affection and movements during the spawning season, and frolics and jostles right lovingly. So much is this the case, that I have repeatedly taken them by hand when they have been too absorbed in their pursuit of each other to be aware of danger.

The chivalrous courage of the salmonidæ in this particular is well known. Especially is it so with the "lordly" salmon. A Guinevere awaiting her victorious Lancelot might emblem a sheeny female salmon awaiting her lord as he wages fierce war against perhaps four or five other fish all equal to himself in size. But shame on female fickleness; if her champion succumbs in the conquest, she is quite prepared, like another Queen of Denmark, to receive a new lord from amongst the victors. A battle of peculiar fierceness of this kind is ably detailed by Mr. Newman in the "Zoologist" for 1847, page 1650: "While several gentlemen," he says, "of the Preventive service were on their rounds the other day and patrolling along the Findhorn between Glenferness and Dalcie Bridge, they observed an unusual commotion among the spawning-beds of the ford. On approaching the spot two large male salmon were seen engaged in mortal combat for a female. Never did chivalrous knights do battle for the hand of a lady fair more fiercely than these lords of the flood. The tranquil bosom of the stream was lashed into foam by the struggles of the finny antagonists, the object of the fray meantime beating silently about, 'spectatress of the fight.' From the appearance of the stream dyed with blood, and gradually assuming its former smooth surface, it was evident that the contest was over. One of the salmon at last floundered on the surface dead, and the victor, it may be conjectured, exhaustedly bore off his prize." From this it would certainly appear that this prince of all fishes tastes to some extent the *vinum demonum* of love. I cannot say much for his parental affection, seeing that some of the older male-fish are most inveterate devourers of the ova and embryo fish.

Trout are also as fierce and plucky in their love affairs, and I have witnessed some magnificent tussles in which, like bull dogs, they have torn the flesh from each other with unrelenting ferocity.

For domestic attachments however the stickleback stands far above all other freshwater fishes. Towards early summer time the male increases in beauty, putting on the most gorgeous dress of green and silver, whilst his movements become inconceivably elegant and swift and full of vivacity. Presently he casts his eyes about him for a suitable locality for his nest, and having selected a site, perhaps in some tiny eddy, he commences to build. The operation of building is a work of time, but it is done in a very workmanlike manner and carefully. First a foundation is laid and cemented with a sort of gluten secreted by the fish himself. Against this currents of water are projected by the fins of the builder, and sometimes, to render certainty doubly certain, he hurls himself repeatedly against the structure. His materials are pieces of stick and other suitable *débris* collected in the neighbourhood. Having securely built the foundation he commences to erect the walls. This is effected in the same style, and finally a nest is com-

pleted, with holes for ingress and egress opposite each other. The whole fabric is repeatedly tested as above described, and when everything seems firm and stable the building is ready for the ova.

Watching the laborious operations of the industrious little gentleman at a respectful distance, behold four or five females of decidedly less brilliant appearance. When he is ready he with sidelong glances and coquettish movements approaches them, and communicates in some inaudible language his wishes and desires. Presently a female, responsive to his invitation, leaves her sisters and follows Sir Stickleback to the nest he has prepared. After entering himself and passing through he indicates that all is in readiness. Lady Stickleback accordingly enters without compunction, and remains hidden for some time. After depositing the ova she passes out the other side, and he enters to complete the process of impregnation. When this is done her ladyship is dismissed, and a layer of sand is strewn over the eggs. This accomplished, another female is invited, and the same operation ensues, again and again, till four or five layers of ova are deposited. Now comes the anxious time for Papa Stickleback. The females are very inquisitive, and have to be kept back most unceremoniously from poking their noses into the nest. They are of a decidedly cannibalistic turn of mind also, and would devour the objects of their lord's solicitude if allowed. So they are sometimes hurled right and left by this piscine Paladin in his twinkling armour of many colours.

After an interval of lesser or greater duration, according to the temperature, the tiny sticklebacks make their appearance. The trouble they are now to their faithful parent transcends all conception. To keep them together and guard them from enemies of all kinds becomes his task, and right valiantly does he perform it. Combat after combat engages him, both females and males are against him, and like a famous historical personage his hand is against every one in the interests of his tiny family. Now and then one little rascal will stray, but only to be brought back in its father's powerful jaws, and to receive an admonitory shake. At last they are disbanded, and "love's labour" for the nonce becomes a thing of the past.

Though not a nest-builder the Miller's Thumb exhibits like characteristics to the Stickleback, and guards its ova and young with a constancy of purpose and ferocity of temper alike amusing and instructive.

I think I have said enough to justify the title of this paper. With salt-water fishes I have not meddled, but doubtless many instances of constancy and affection might be cited in reference to them. The variety of fish-life is marvellous, and in the scale of being one is sometimes disposed to elevate them highly.

JOHN H. KEENE.

BOTANICAL WORK FOR JUNE.

THE lateness of the present botanical season will enable us somewhat to mitigate the confusion which prevails about *Cardamine hirsuta* and *C. sylvatica*; perhaps a few words will make them more easily understood. It is very likely that only one plant (*C. hirsuta*) has been examined by many workers, hence the confusion.

1. *C. sylvatica* (Link). Biennial, radical. Leaves very few. Leaflets large, light green. Lower leaflets only on short petioles distinctly lobed.

2. *C. hirsuta* (Linn.). Annual, radical. Leaves in a dense rosette. Leaflets all on short petioles, small, dark green.

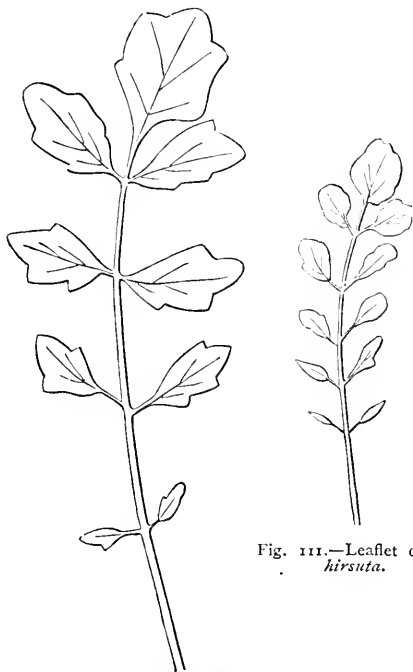


Fig. 110.—Leaflet of *Cardamine sylvatica*.

The illustrations are of the natural size.

Vegetation of every kind is backward; this is the latest spring we have ever known, but we shall find the silver-weed plentiful during the present month. The name *Potentilla anserina* (Linn.) is made to cover two very dissimilar forms in our English Floras; having met with them in many counties, we have the more confidence in bringing them before our readers, and for this purpose have adopted the names in *Fl. des Environs de Paris*.

1. *Potentilla incana* (Cuss. et Germ.). A large plant. Leaves densely covered with silvery down on both sides.

2. *P. pusilla* (Cuss. et Germ.). A smaller species, known by its compact rosette of radical leaves, which lie close to the ground, seldom, or with but few hairs on upper surface.

No. 1 is our common species, No. 2 is frequently seen by waysides.

Herb Robert, or Stinking Crane's Bill, now makes many a shady lane gay with its fern-like leaves and elegant blossoms. Let us spend a few hours during the present season in looking over its many peculiarities: first, we shall find it can adapt itself to all kinds of conceivable situations, then we shall observe it differs widely in appearance and habit: thus, at least, three distinct varieties are met with.

1. *Geranium Robertianum* (Linn.), (proper). A large straggling plant covered with glandular hairs. Claw of pet. equal in length to the blade. Carpels hairy.

2. *G. modestum* (Jord.). A smaller plant, with more tufted habit, nearly or quite glabrous (smooth).

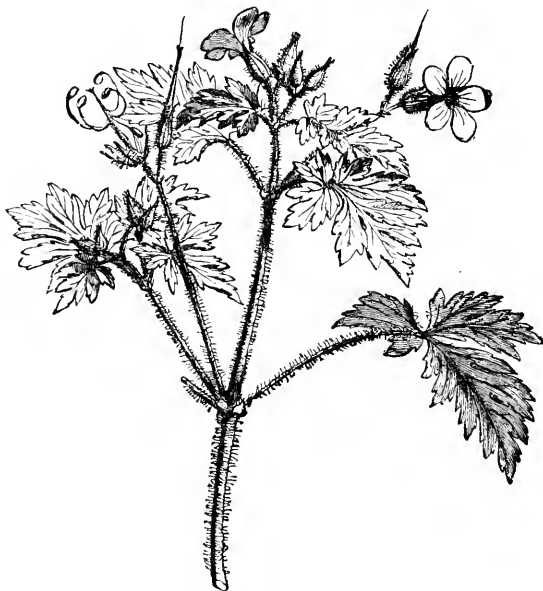


Fig. 112.—Herb-Robert (*Geranium Robertianum*).

Claw of pet. much longer than the blade. Carpels glabrous.

3. *G. purpureum* (Jord.). A beautiful plant, veins of leaves and internodes tinged with pink. Pets. purple. Leaves finely cut and divided.

Nos. 1 and 3 are our lowland species; the smooth plant, No. 2, is found on hills; we generally expect to find it in gravel pits.

The common Stork's-bill is now worthy of notice, although it is an unpleasant plant to handle.

4. *Erodium cicutarium* (Linn.) wherever it occurs, is generally seen in abundance, and probably the varieties named below are not uncommon in most districts.

5. *E. cicutarium* (proper) has flowers whose petals are not spotted, and carpels furrowed. Leaves small, not much divided.

6. *E. commixtum* (Jord.), a larger and coarser-looking plant. Leaves not unlike *E. moschatum*. Upper petals distinctly spotted at the base.

7. *E. pilosum* (Bor.). Upper petals not spotted at the base. Leaves much cut and divided, with long hairs over the whole plant.

During the past few years, our rambles have chiefly been over gravelly and sandy fields; these, although in a great measure barren to the farmer, have yielded



Fig. 113.—*Filago canescens* (Jord.).



Fig. 114.—*Filago spathulata* (Presl.).

us a rich harvest; amongst the rest, the cud-weeds have received a thorough investigation, so that now we number probably fifty sheets in our British herbaria, containing specimens of the *Gnaphalia* and *Filago*; the latter are not so numerous, and vary but little, but we lay before our readers the British section of this genus, because we do not regard *F. gallica* (L.) as a native species—it is now by all our best botanists looked upon as a colonist only.

Filago.—Section 1. Procumbent; section 2. Erect.

Section 1.—In "Student's Flora," *F. germanica* (L.) covers all the following forms, viz.:

1. *Filago canescens* (Jord.), (species according to continental authorities) leaves linear, tomentose. Heads of flowers leafless, tips of bracts yellow; common in sandy pastures. Fig. 113.

2. *Filago apiculata* (G. E. Sm.), much larger than the last; bracts purple. Keel-shaped, tips deep pink. Rare.

3. *Filago spathulata* (Presl) (species). A short tufted plant. Leaves *spathulate*. Bracts, keel-shaped, tips pale yellow. Frequent on gravelly soils. Fig. 114.

Section 2.—4. *Filago minima* (Fries). Leaves $\frac{1}{4}$ -inch, very small, lanceolate. A small, slender, and erect species, from 6 to 10 inches. Frequent on dry sandy banks.

A FISHING RAT.—While standing by a stream the other day I saw a large grey rat swimming about with unusual activity, and observing its movements for awhile I saw it dive below a bank, reappear and dive again, and so continue for some time; but at last to my surprise it reappeared with a fine trout in its mouth, four or five inches in length, and struggling in vain for its life, while the rat made quickly for its hole apparently elevated with success.—*T. Sim, Fyvie.*

THE BEAR IN SWEDEN AND NORWAY. By JOHN WAGER.

PART I.

THE writer, though not a sportsman, has indulged in many wild and solitary wanderings through Swedish forests and over Norwegian fields; several times he has been benighted amid such scenes, yet never chanced to make personal acquaintance with Bruin in his native resorts, though he frequently heard of his proximity, and once saw the remains of a bear that had been shot by a peasant on the previous day; he has also collected sundry ursine anecdotes, which naturalists inclined for gossip may be willing to hear. First, however, it will perhaps be well, for the benefit of readers not familiar with the subject, to prefix a brief account, from Scandinavian sources, of the natural history of the northern bear.

The peasants of Norway and Sweden distinguish several kinds of bears, such as the grass-bear, the ant-bear, and the horse-bear; but these are mere varieties, or individuals in different stages of development, of one and the same species. Its colour is dark brown or nearly black; sometimes lighter, and especially valued when the fur is tipped with silver-grey. A full-grown bear will measure six feet, or even more in length, by three feet in height; and weigh from five to six, and occasionally eight, hundred pounds. Bruin has a sweet tooth in his head, and while young at least, usually contents himself with a vegetable diet;—grass, roots, the juicy stem and leaves of angelica, whortleberries, cloud-berries, and other berries which abound in the forests, including those of the rowan tree; ants, also, and their eggs vary his diet, whence certain bears which habitually eat them are called ant-bears; and the more delectable honey, with the comb and larva, which he devours with keen zest, quite regardless, in his thick coat, of the infuriated bees. During the very dry, hot summer of 1868, when bruin's favourite feast of whortleberries failed him, he was constrained, said Norwegian papers, to quit his customary solitudes, and betake himself like a sturdy beggar or downright thief, to the vicinage of human dwellings, and there lay violent hands on anything devourable that came in his way; yet without doing bodily harm to man. When, however, the bear gets older, and once gains a taste of flesh, he thenceforth prefers it; and has doubtless a regal share of the six or seven thousand sheep, goats, pigs, horses, and horned cattle that are annually destroyed by wild beasts in Sweden alone. A bear may remain a considerable time upon a tract without its presence being particularly marked; but should it chance, either from spontaneous impulse, or outward irritation, once to kill a domestic animal, it is sure, unless prevented, to attack others in quick succession; lurking in the neighbourhood of the spot where the cattle graze, and watching its opportunity to start from its hiding-place upon any luckless cow

or heifer that strays from the herd, and striking it to the ground with a blow of its heavy paws, or clinging to its throat till it falls exhausted from loss of blood. The cattle, however, not unfrequently begin the attack, and receive the death-blow by rushing, with a loud bellow, upon the enemy whom one of them has chanced suddenly to espy.

The prodigious strength popularly ascribed to the bear is scarcely exaggerated; in reference to this, bear's sinew formed a constituent of the chain or cord by which the terrible Fenri wolf of Norse mythology was sought to be bound; and the Swedish proverb which asserts that *Nallé* (*Bruin*) does not smite with a twig, is true indeed. For with one blow of its massive club—its fore-paw—it can strike a heifer to the ground; and a bear, walking upright, has been known to carry a horse in his fore-paws across a timber-log placed over a rushing stream. The northern horse is not however so large as our own. In attacking animals it rears on its hind legs and striking with its chief weapons send their terrible claws deep into the flesh; but against man it more rarely assumes this position; creeping towards him, more usually, on all fours, as if awed by his glance, and making use of its teeth. When it would make prey of a horse, encountered on open ground, it usually fixes the claws of one paw in the horse's neck or breast, and allows itself to be dragged away till it can seize a tree to hold by with the other, or till the exhausted animal succumbs.

The bear has a good appetite; in the course of a day and night he can eat the most of a young heifer, beginning his repast even before the victim is quite dead. After satisfying his hunger he either buries the remainder of the meal or leaves it on the spot and returns soon. He will not, *Pontoppidan* states, like the sneaking wolf, feed on any dead carcase he chances to meet with, but likes meat of his killing, nice and fresh. Inwards, especially the kidneys, he seems to relish most; cow's-udder too is one of his choice bits, and it has often happened that a cow has come home to the seater in the evening with her udder torn off. Now and then, when it can surprise the vigilance of the wild reindeer it indulges in venison; and on the other hand, though not partial to fast-days,

"The grim, taciturn bear, the anchorite monk of the forest," partakes, for a change, when he can get it, of a dinner of fish. Sometimes he becomes unusually exorbitant in his demands; savage and surly beyond his wont. A peasant of *Transtrand*, the northernmost part of the wild province of *West Dalecarlia*, informed the present writer that in 1850 a monstrous bear infested the neighbourhood; tearing the roofs from byres and making sad havoc with the cattle within. Nor were the attempts to get rid of this violent marauder at all successful, till a peasant at length caught him red-handed, and having no weapon more effective than his tongue, conjured him with these awesome words: "If thou comest to me, thou Satan, I will dash thee

against the wall;" whereupon the terror-stricken brute "no Christian bear" hurried away, and was not seen or heard of in the neighbourhood again. When a bear thus breaks into a cattle-shed, after slaughtering what he deems sufficient, if undisturbed, he always returns the same way, dragging with him, usually, a portion or the whole of his victim.

The bear, if let alone, is not greatly dangerous to man; who, under ordinary circumstances, may generally pass within view of him in the forest without serious occasion for alarm. But such an interview, during summer at least, is not often obtained; for the bear's acute senses—his quick hearing, sight, and scent give him timely notice of human approach, and he usually keeps out of the way. Even when wounded by the hunter's shot he more frequently flies than hazards a close fight. If, however, on such occasions, the bear does turn upon his foe, the hunter has the utmost need of cool nerve and a sure aim, or of a sharp weapon, wielded by a strong arm. Such encounters are most frequent with she-bears whose young have been shot or taken; but there are old, experienced he-bears also equally ready for a passage of arms. Heavy and clumsy as the bear appears when tamed, it is agile enough in the wild state; running more quickly than any man, and clambering up trees with facility, though it descends them, rear foremost, with great caution. It can swim with speed, but not very enduringly; its thick, shaggy, absorbing coat being necessarily an encumbrance in the water.

The bear, like the jetties, a giant brood of old saga, retreats before advancing cultivation, but is yet tolerably numerous in the more northerly parts of Sweden, where continuous forests cover hundreds of square miles; especially in the wilder parts of *Wernland*, *Dalecarlia*, and that vast, most northern, division of the kingdom called *Norrland*, which includes *Lappland*. When in *Norra*, *Finskogen*, *Wernland*, a few years since, the writer heard of a peasant hunter there who during one winter had shot ten bears in the forest tract. They are still more frequent in Norway, being found to some extent all over the country, right up to the Russian frontier; though very rarely and incidentally in the southern lowlands, and not very numerous in *Finmarken*, the northern extreme of the land, corresponding with the Swedish *Lappmark*, or *Lappland*. The forest and hill tracts of *Thelemark*, the whole province of *Throndhjem*, *Österdal*, and *Norrland*, the most northerly province except *Finmarken*, are the localities in which he is now most extensively found. His favourite haunts are desert regions where pine-forested hills interchange with cloven rocks, wide stretches of moss, and mire, and grassy, herbaceous plots. From these elevated solitudes the northern king of beasts often takes a tour of longer or shorter duration over the open tracts of the higher mountains; but his proper domains are the dusky pine forests that stretch wide over the subordinate hills.

About the end of October, when the stringent winter of the North, with its attendant scarcity of food, begins to be felt in his high-lying and dreary realm, the bear altogether ceases to eat, and prepares a dormitory in which to sleep over the season of cold and dearth. This lair, *ide* or *hide*,* is usually in the deep cleft of a rock, under an old tree root, or in a pit which he digs for himself. Into such sheltered recess he gathers abundance of moss, ling, and spruce-twigs; and in November, with an empty stomach, lies down on this soft bed, rolled up usually in his thick, furry cloak, with his head between his hind feet, and resigns himself to a deep, oblivious sleep till the return of milder days. It is believed by the peasants that before commencing his long slumber he makes a two days' trial of the chosen site, to see that it is undisturbed and secure. Nor is sleep afterwards always unbroken; for though he sleeps hard while the cold continues extreme, and is quite sluggish if then disturbed, yet as spring approaches his slumbers are often so light that he awakes and takes to flight on the occurrence of the slightest noise, even when otherwise he would have enjoyed a long continuance of repose. If the prevalence of rainy or foggy weather has rendered his dormitory uncomfortably wet he will generally turn out for fresh twigs, or in quest of a drier site.

Eating nothing during the whole period of hibernation the bear wastes the flesh and fat previously accumulated; and though he continues in good condition till after Yule, is necessarily very lean and weak when, in April or May, he leaves his retreat. He then at first contents himself with lighter diet, such as ants and insect larvæ, but gradually taking more nutritious food, soon regains his normal weight and strength.

A month after the bear has left his winter lair he seeks a mate and the pair associate till into July. The female brings forth her young, in the lair, towards the end of January; she has from one to three, rarely four, at a birth, and though sometimes she eats nothing, she gives them suck. They give no early promise of future greatness and prowess, being only about eight inches long, blind and toothless; but they wax apace, and have already assumed importance when they quit their nursery in spring. The dam and cubs keep company till autumn; but if the former again becomes pregnant she will not allow the cubs to share her winter's retreat, and though far from full-grown they must learn to make a bed for themselves. In other cases the whole family lie together and continue to associate after again emerging from the lair; and sometimes do not entirely separate before the young are from three to four years old, and have founded families themselves.

(To be continued.)

ON MOUNTING SEEDS.

I SHOULD advise every possessor of a microscope, who has not already turned his attention to the examination of various seeds, to do so at the earliest opportunity, and he will readily admit, after careful study, how amply his labours have been rewarded.

It is my intention in this short paper to give a few hints which may be useful to the young microscopist, as to the easiest way of preparing seeds as permanent objects for the microscope, and also a list of the most curious and interesting.

Some seeds may be mounted dry, whilst others require to be put up in balsam; the first method being more simple than the latter, and may be used in all cases where the seeds are to be viewed as opaque objects, or are very transparent in themselves.

Before commencing you will require the following apparatus:

1. Wooden slides with hole in the centre.
2. Glass slips 3×1 .
3. Thin glass in circles.
4. Small glass tubes.
5. Camel's-hair brushes.
6. Coloured paper for covering object slips.
7. Bottle of Canada balsam.
8. Bottle of turpentine.
9. Bottle of gum mucilage thickened with starch.
10. Bottle of cement made by dissolving shellac in naphtha.
11. Spirit-lamp.

Having these requisites at hand, you may at once proceed.

Suppose for example, you wish to mount some seeds as opaque objects. First take one of the wooden slides and gum a piece of cardboard over the hole in the centre, you will then have a kind of cell; in the middle of this cell paste a small square piece of cardboard, then paint the inside with Indian ink. When the paint is dry, brush over the square in the middle of the cell with gum, and place the seeds in various positions on it, and if placed near together, you will have a perfect square of seeds.

Wait then until the gum is dry: and I may here mention the advisability of having two or three slides in hand at once, so that time may not be wasted. After the gum is quite dry, proceed to lay on one of the circles of thin glass, which, of course, must be larger than the cell. Then dip a camel's-hair brush into the shellac fluid, and go round the edge, touching the glass and the slide at the same time. If this be done properly, the glass (when the shellac is dry) will be quite hard and fast to the slide. Some people, I know, fasten theirs down with small strips of paper; but I have always found the shellac to be just as easy, and to my mind more serviceable.

Nothing then remains but to finish off with ornamental paper, taking care to label it.

* Related to the English *hith*, a small haven.

You will then have a very presentable and interesting object.

If the seeds are transparent enough to be viewed by transmitted light without being mounted in balsam, merely lay them on one of the glass slips, cover them with thin glass and cement down with the shellac as before. Finish off with coloured paper, or if you have a turn-table, run a ring of white lead varnish over the shellac; when this is quite dry add another: label and put away in your cabinet.

Mounting in balsam is somewhat more difficult to manage; but practice makes perfect, and we must not be disheartened by failure, but try again. The great difficulty seems to be in laying the covering glass down without the object shooting to the side, or air bubbles making their appearance. However, with a little care these difficulties will be overcome. The seeds should be allowed to remain for some time in turpentine previous to mounting.

Whilst they are soaking, clean one of the glass slips, and with one of the tubes transfer a drop of balsam to the centre of it. Then take the seeds from the turpentine and lay them in the drop of balsam on the slide. Hold the slide for a minute over the flame of the spirit-lamp until the balsam runs towards the edge, taking care that you do not boil it or spill it.

Have one of the covering slips ready; lay it on the balsam and lower very carefully. When you have it down quite level, and seen that no air bubbles have made their appearance, put it between the jaws of an American clothes' peg filed flat down for the purpose, and set it by to dry. I may here mention that it is necessary to keep the slips in a warm place, or else it will be weeks before the balsam is quite hard.

After waiting until the balsam is quite hard set, the slide may be cleaned with a rag dipped in spirits of wine and finally labelled.

The following are seeds easily obtained and worth mounting as opaque objects:

Anagallis, *Anethum graveolens*, *Begonia*, *Carum carui*, *Datura*, *Digitalis*, *Elatine*, *Erica*, *Gentiana*, *Hyoscyamus*, *Hypericum*, *Linaria*, *Lychnis*, *Mesembryanthemum*, *Nicotiana*, *Campanula*, *Petunia*.

The following as transparent objects in Canada Balsam:

Drosera, *Hydrangea*, *Monotropa*, *Orchis*, *Tar-nassia*, *Pyrola*, *Saxifraga*.

There are scores of others which are both beautiful and interesting, and I trust that many will be inclined this summer to add most of these to their cabinets.

Devonport.

CHARLES H. DYMOND.

CATERPILLARS AND ONION-CROPS.—For several years past the onion crops in this neighbourhood have suffered severely from the ravages of the caterpillar of some insect. Can any of your readers suggest a remedy?—P., Haslemere.

NOTES ON *HYDROPHILUS PICEUS*.

By JAMES FULLAGAR.

A CORRESPONDENT asks whether the *Hydrophilus piceus* can be reared in captivity. It is my opinion that it cannot, as I do not think that the proper food of the larva is known. Perhaps the following remarks, with the sketches, will help him in obtaining the information he needs. On one very bright sunny morning in March, 1872, while searching for some subjects of natural history, I saw, basking in the sun, on some weeds at the surface of a pond, a very fine specimen of the female *Hydrophilus*, which I soon, by the aid of my net, transferred to my bottle. As soon as I reached home, I placed her in a glass vase, holding a gallon or more of water, in which was growing a quantity of duckweed, and other pond

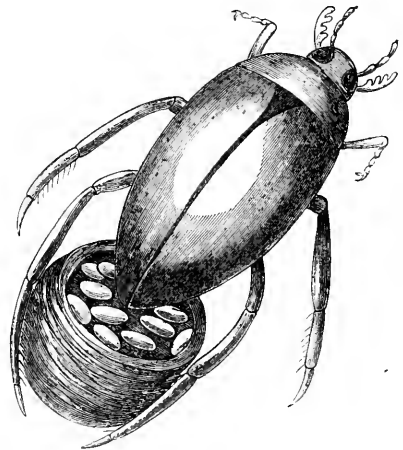


Fig. 115.—*Hydrophilus piceus*, in the act of depositing her eggs.

weeds. She went directly to the bottom and hid herself under the weeds. I often noticed her as I passed the vase, and on April 20, I observed that she had a quantity of white matter at the posterior end of her body, and I concluded, as she was at the surface of the water, that she was either dying or dead, but on examining her closely, I found that she was spinning a silken nest, or cocoon, and depositing therein her eggs. The nest was held firmly between the hind legs, as shown in the sketch (fig. 115). After the whole of the eggs were deposited, she covered them up, rendering the top gradually smaller and smaller, forming a sort of shaft, which, when the cocoon was disengaged from between her legs, floated at the top of the water, slightly attached to a piece of anacharis, with the shaft, or tube, in an upright position (fig. 116). When the cocoon was complete I removed it to a smaller glass of clear water, so that I could have a better view of the young when hatched. This I watched from day to day until May 15, when

I saw the young escaping from the cocoon. I counted twenty-five of them. They lived over a month, but I had not the proper food for them. From the form of the head and the formidable tusks, &c., I concluded that they were carnivorous, like the voracious larvæ of

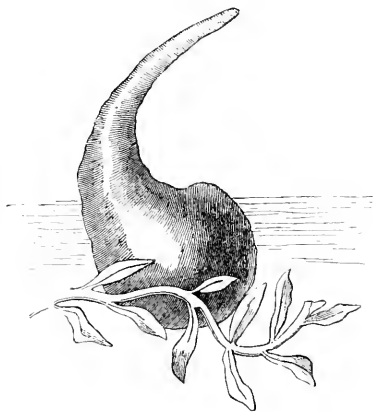


Fig. 116.—Nest or cocoon of *Hydrophilus*.

the circulation was visible. I made a large sketch of the larva, to enable me to show its form, and omitted the middle sections of the body, so that the head and tail only are shown (figs. 117, 118). I have now by me the empty cocoon. The sketch of the beetle and the cocoon are of the natural size, that of the larva is, of course, much magnified: the real length of the larva at a week old was half an inch.

The following is from Maunder's "Treasury of Natural History," and would, perhaps, be interesting to your readers: "*Hydrophilus*, a remarkable genus of aquatic insects, differing from that of *Dytiscus* only in the structure of the antennæ, which, instead of being setaceous, are short, and furnished with a clavated and perfoliated tip or knob. One large species, common in our ponds and ditches, is an inch and a half long, oval, and of a deep brown colour, highly polished. The eggs are laid in a sort of cocoon spun by the female, and coated with a gummy matter which is impervious to water, on which it floats. The larvæ are observed to prey on the smaller kinds of water snails, tadpoles, &c., and appear very voracious; and they remain about two years before

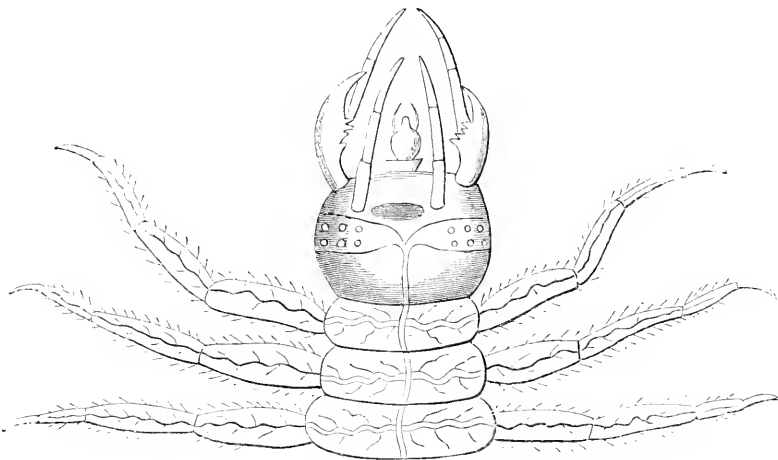


Fig. 117.—Head of larva of *Hydrophilus* (mag.).

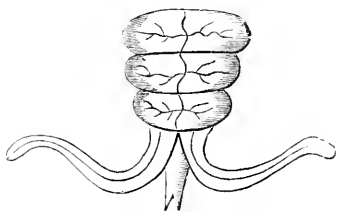


Fig. 118.—Tail of larva of *Hydrophilus* (mag.).

Dytiscus marginatus. The young larvæ were very transparent, and the circulation in every part of the body was plainly seen, and formed a beautiful object under the microscope when placed in a very shallow cell; even up to the end of the curved tail appendages

they change into pupæ or chrysalides. When the larva is arrived at its full growth, it secretes itself in the bank of the water it inhabits, and, having formed a convenient cell, lies dormant for some time, after which it divests itself of its skin, and appears in the form of a chrysalis; in this state it remains some time longer, when it again releases itself of its exuvie, appears in its complete or beetle form, and as soon as the elytra or wing-cases acquire a sufficient degree of strength and colour, it comes forth from its retreat, and commits itself in its new form to its native element. It is a curious circumstance that some of the species of *Hydrophilidæ* found in this country exceed in size those from tropical climates; many of the species are, however, very minute."

MICROSCOPY.

MOUNTING IN CANADA BALSAM.—Being an amateur mounter I took an interest in Mr. Underhill's article in last month's number of *SCIENCE-GOSSIP* on the "Preparation of Insects for Microscopical Examination," and have no doubt that by the time this series of articles is concluded I shall have obtained many useful hints, but at the same time I think I can myself give a few hints in return, particularly with respect to mounting in Canada Balsam. Mr. Underhill advises the use of test-tubes, in which to keep the Canada balsam. I have never used test-tubes myself, but cannot believe they are either so handy or cleanly as two-ounce wide-mouthed capped bottles, to be obtained at 1s. each. The balsam is applied by means of a small brass rod drawn to a point, and always kept in the bottle ready for immediate use; a knitting needle will also answer this purpose, but will require cleaning occasionally. If, however, very large covers are used, I would then advise a glass syringe, as recommended by Dr. Carpenter.

Then again, I cannot say I like the use of clips, and never employ them if I can possibly help it. The pressure of the clip causes the covering glass to "dish," and when the clip is eventually removed the cover springs back to its original position, causing a suction all round the edge, and in case of "fluid" mounts a running in of the cement; an apparent shrinkage taking place when balsam is used, but this is easily remedied.

When mounting in fluid I prefer to have the cell quite as deep as the object, and when the cover is put on, if the superfluous fluid be removed by means either of bibulous paper or a damped camel's-hair brush, it will be found that the cover is held down by suction sufficiently firmly to enable a very thin coat of cement on and just over the edge, to be dabbed on by means of a brush; when this cement is dry the slide can be further washed, as directed by Mr. Underhill, and extra coats of cement applied by means of the turn-table.

I doubt if balsam would ever set without some heat, but at the same time I think it very risky to apply heat by means of a lamp. My own method is to mount without heat, and after the lapse of a day or two to place the slide upon the top of a hot-water cistern for a bath, the heat of which can be moderated as desired by means of slips of wood placed under the slide, which will have to remain there for a week or even longer, according to the size of covering glass and thickness of balsam.

I could say a little on "coaxing" air-bubbles out of Canada balsam; there is a knack in getting rid of these pests. In many cases, however, the bubbles are merely vapour of benzole, and will disappear spontaneously in the course of half a day or so, being re-absorbed by the balsam.—*L. M.*

THE THALLUS OF DIATOMS.—In a recent number of the "*Journal de Micrographie*," Dr. M. Lanzi has a note on this subject, in which the thallus, or gelatinous stem or stipes, of certain species of diatoms is carefully delineated. These gelatinous stems, he says, are produced by the accumulation of plasma within the cells, which takes place to such an extent as to issue from the pustules. This plasma plays the part of an organ of vegetation, and therefore does not properly afford either by its presence or absence any distinction of species. It may furnish nutriment to the young diatoms, or even may serve to distribute the species by dividing into parts, which are carried off by the water. Dr. Lanzi thinks that all genera founded upon the character of the thallus and its form should be abolished.

MICROSCOPIC ORGANISMS IN BLOOD.—Under the title of "The Microscopical Organisms found in the Blood of Man and Animals, and their relation to Disease," Dr. T. R. Lewis, of the Army Medical Department, and who is also Special Assistant to the Sanitary Commissioner with the Government of India, has published another small quarto work of about ninety pages. It describes the various vegetable organisms found in blood during splenic fever. Pneumo-enteris of the pig, recurrent fever, &c.; the relation of microphytes to disease; vegetable organisms in healthy blood; spirilla and their supposed relation to disease; protozoa in blood, such as flagellated organisms, nematoids and their embryos, *Filaria sanguinis-hominis*, &c. This is one of the most thoughtful of Dr. Lewis's works.

EFFECTS OF STARVATION.—From the office of the Superintendent of Government printing, in Calcutta, there has just been issued Dr. Cunningham's report on "Certain effects of Starvation on Vegetable and Animal Tissues," in which we have detailed from microscopical examination, and experiment, the full effects of a deficient supply of nutritive material both on animals and vegetables. In the latter this is chiefly manifested by the growth of microscopic fungi. The chapter on "Phenomena observed in the post-mortem examinations of cases of famine—diarrhea, and dysentery," is a most valuable essay to Indian pathologists particularly. We hope Dr. Cunningham may be able to continue his important researches with the same success as heretofore.

THE COLOUR OF ST. PAUL'S CATHEDRAL, ETC.—Last year Professor Paley contributed an article to *SCIENCE-GOSSIP* suggesting that the dark colour of the stone-work of St. Paul's and other churches might be due to organic agency. No answer was given to his queries. The "*American Quarterly Microscopical Journal*" states that Professor Leidy finds that the black or smoky colour found on old walls in narrow shaded streets is caused by an alga closely resembling *Protococcus viridis*. It may be this plant in a particular stage, but Professor Leidy

has provisionally called it *Protococcus lugubris*. The specific name suggests that even microscopists are not deficient in humour.

"THE AMERICAN QUARTERLY JOURNAL OF MICROSCOPY."—Since the cessation of the publication of the "Lens," until October, 1878, microscopy in America was only represented by the unpretentious little "American Journal of Microscopy." This, like our own SCIENCE-GOSSIP, aimed at giving accurate information, divested as far as possible of scientific technicalities. It was, however, felt by the leading microscopic workers in that country that a journal of a higher scientific standard was desirable, and some nine months ago the first part of the above-named journal made its appearance. With the exception of a few typographical errors it was well printed and illustrated, and contained much valuable original matter. We have just received the third part and perused its contents with much pleasure. The various papers are the productions of men who are well acquainted with the subjects on which they have written. The contents may be thus enumerated:—two histological papers: "The Ampulla and Pancreatic Ducts in the Domestic Cat" (continued), by S. H. Gaze; a case of "Tubercular Meningitis," by P. J. N. Danforth. Two botanical: "The Structure of Ophioglossum," by Prof. M. Harrington; "Dubious Forms of Freshwater Algæ," by the Rev. Francis Wolle. Three mechanical: "The Formation of the Paraboloid as an Illuminator" (in which he tells us "How it is Done"), by F. H. Wenham; "A few Remarks on Angular Aperture and Description of a Universal Apertometer," by Prof. H. L. Smith; Two forms of "Comparators for Measures of Length," by Prof. W. A. Rogers. One on mounting: "Practical Hints on the Preparing and Mounting of Animal Tissues," by Dr. Carl Seiler (continued). One infusorial: "The Simplest Forms of Life," by E. Eyrforth. The two first are perhaps too technical for the general reader; the remaining papers will, however, be found interesting to the microscopical student. Mr. Wenham's paper on the "Formations of the Paraboloid" contains minute directions for the construction of that very valuable accessory. The article commences with a reference to a paper read before the Microscopical Society (now the R. M. S.) in 1856, in which he proposed a right-angled prism, connected to the under surface of the slide by a fluid intermedium which transferred the total reflecting surface from the prism to the top plane of the cover. We quote the following paragraph (p. 187), with which our readers will cordially agree: "It is to be regretted that in this country the noble art of mechanical construction should be held in such low esteem as not to be considered a worthy element of education enabling persons to carry their own ideas into practice without being stopped by heavy artisan's bills." We supplement this by remarking that it is also to be regretted that but few will take the trouble to learn, even

theoretically, the principles upon which the microscope and its accessories are constructed. Professor Smith's paper will commend itself to those who are interested in the possible angle of aperture of objectives. Those who have turned their attention to micrometric measurements can appreciate the difficulty of subdividing a unit accurately; we have also the difficulty of obtaining some trustworthy division of the inch, or the centimetre, with which to compare the micrometric divisions, but supposing this obtained we rarely find that divisions on the micrometer are of equal value. Professor Rogers gives a table of measurement of 50 spaces made with the most accurate appliances obtainable, and only in one instance do the errors correct each other, the largest average amount of error was found to be $\times \frac{22}{100000}$ inch. For ordinary work the slight errors in the division of the micrometer are not of more importance than an error of $\frac{1}{50}$ inch in the length of a carpenter's rule, but when the value of important evidence (as in ascertaining the source of blood-stains by the average diameter of the discs) depends upon perfect accuracy, our readers will see how necessary it is that our measuring instrument should be absolutely free from error. Dr. Carl Seiler's paper is continued from the previous number, and contains some valuable hints on the preparation, staining, and mounting of animal tissues. For the purpose of staining, the writer recommends the sulphindigotate of soda, "the effect of this mode of staining is to leave the nuclei bright red, while the formed material of the cell is slightly tinged with blue. The connective tissue fibres become stained with a deep blue cover, while the blood vessels are purplish and mapped out with surprising distinctness; epithelium and hair take this staining in a very curious manner, inasmuch as the cells of different ages take different colours, varying from a brilliant emerald-green to purple, violet and olive-green." Excepting in a few special cases, Dr. Seiler prefers a solution of Canada balsam, prepared according to Dr. J. T. Woodward's formula, as follows: "A clear sample of Canada balsam is evaporated either in a water bath by artificial heat, or better by placing it in a shallow dish and exposing it to the heat of the sun until it becomes hard and brittle throughout when cold, and until all odour of turpentine has disappeared when warm. This resinous balsam is then dissolved in warm absolute alcohol to the consistency of thin syrup and filtered through flannel. If by accident the balsam has become brown during exposure, the alcoholic solution may be bleached by exposure to sunlight.

"The advantages of this material are that it soon becomes hard round the edges of the cover, and can be scraped off to finish the slide; that it never crystallises, as other resinous mounting media frequently do, and that it improves the appearance of the object by age.

"The author gives the following recipe for a cement to be used for fixing the covers on glycerine-mounted slides, and which he says is glycerine proof.

"Cox's gelatine, 5ii; acetic acid, fl. 3i; gum ammoniac, gr. x. Dissolve in a water bath, and filter through cotton while warm. This cement remains fluid when cold and dries quickly. After the ring has become set or stiff, the whole slide is immersed for a minute or so in a 10-grain solution of bichromate of potash, and is then allowed to dry, exposed to the light, which makes the bichromated gelatine perfectly insoluble even in boiling water, and thoroughly prevents the escape of any glycerine."

This very ingenious method of employing bichromated gelatine can be used for most fluid-mounted preparations, and we have no doubt that where soft balsam is used, it would form a very good foundation for the coloured cements now so generally employed, and effectually prevent their "running on." We cordially recommend this journal to those interested in microscopical studies, and advise all microscopical societies to add it to their libraries. This work in conjunction with the Transactions of our own Royal Microscopical Society will keep the members posted up in the latest microscopic news.—F. A., F.R.M.S.

EUGLENA VIRIDIS AND HYDRATINA SENTA.—Your answer to M. H. Robson anent the *Euglena viridis* leads me to mention the following circumstance. A little while ago, I obtained a sample of water from a pond literally green with swarms of what was, to all appearance, the *Euglena viridis*. Careful examination of them, however, engendered a doubt in my mind as to their identity with the true *Euglena*, for I discovered that the flagellum was in each case *bulbed*. I put the water aside for about a week; on again examining the objects, I was rather surprised to find that the *Euglena* (?) had nearly all disappeared, their place being taken by the common Funnel Rotifer (*Hydratina senta*) in various stages of development. This circumstance seemed to confirm my previous suspicion, and favoured the notion that the objects first observed were not the true *Euglena viridis*, but were the larvæ of the *Hydratina senta*. Has Mr. Robson or others noticed any such metamorphosis in the specimens? If so, will not the *bulb* serve as a feature whereby to distinguish the true *Euglena* from other objects of similar shape and colour?—F. Jas. George.

THE FUR ON THE TONGUE.—A singularly interesting paper has been read before the Royal Society, by Mr. H. Trentham Butlin, F.R.C.S., on the above subject, in which he showed that the so-called "fur" is in a great measure due to the glæa of certain forms of microscopical fungi. In order to ascertain the true nature of glæa, and to obtain it in a purer form, it was cultivated upon a warm stage. Several fungi were then discovered, but only two kinds were present in every experiment, viz., *Micro-*

coccus and *Bacillus subtilis*. As the glæa produced artificially was similar to that existing naturally in the tongue fur, Mr. Butlin believes that "fur" is composed essentially of these two fungi. *Micrococcus* developed freely and abundantly, forming large masses of yellow or brownish-yellow colour. *Bacillus* did not develop, but existed in greater or less abundance in all the cases examined. Mr. Butlin thinks that one cause of its artificial non-development may be the presence of other developing organisms, and that development takes place freely upon the tongue. Its habitual occurrence there, and the presence of spore-bearing filaments favour this view. Besides the above, other fungi were present, as *Bacterium termo*, *Sarcina ventriculi*, *Spirochata plicatilis*, *Spirillum*, etc.

ON CLEANING OLD SLIDES MOUNTED IN BALSAM.—Having seen a great deal lately about cleaning old slides in your columns, it has occurred to me that the method I use might be serviceable to some. The process is as follows: I first heat the slide over a spirit-lamp until the balsam is soft, then I scrape the covering glass off, and as much balsam as possible. I let it dry and chip off all I can with an old knife; and when I have taken it off, I soak a rag in turpentine and rub the slide well with it (renewing the turpentine when necessary) until all the balsam is removed, which it is in a very short time.—H. C. Bristowe.

ZOOLOGY.

NOCTURNAL SONG OF BIRDS.—There have appeared from time to time in SCIENCE-GOSSIP inquiries concerning birds singing by night. On the third of last month (May) a thrush was heard singing long and loud after 10 P.M. a little way out of this town, on the Tring Road.—J. W. Slater, Aylesbury.

AERATING AQUARIA.—Dr. Lenz, of Lubeck, has devised a method of aerating the water in an aquarium. A tube conducting the air to the bottom is expanded at the end and stuffed with fine sponge, which causes the air to rise through the water in very minute bubbles.

THE "SCIENCE INDEX."—We have received the first part of a new publication bearing the above name. It is edited by Mr. A. Hildebrandt, and published in Manchester, and professes to be a "monthly guide to the contents of the scientific periodicals." Such a work is much needed, and the "Science Index" promises to fulfil the duty well, in spite of some errors in the first part, which are evidently due to the haste with which it has been got out.

MALE EELS.—In the "American Naturalist" for May, Professor Packard announces the discovery of *male* eels. At first they were supposed to be immature females, but the question is now finally settled,

for out of one hundred and ninety-three eels supplied by the United States Fish Commission three have been found to be males. Professor Packard found the nucleated spermatozoa in the cells.

BOAR-FISH (*Capros aper*, Lacép.).—Numbers of these fish have been thrown up on the beach here during the present month (April); I have had thirteen specimens brought to me, all of which are very uniform in length, viz. 5 to 5½ inches. No transverse bands were visible in any of them, but the general rosy-pink colour was very vivid in most. I observe that some of your correspondents refer this fish to the genus *Zeus* (Linn.), but there are very marked distinctions between the genera *Zeus* (Linn.) and *Capros* (Lacép.): e.g. in the former the body is without scales, and the first dorsal carries a series of long filaments; there is also a row of spinous scales at each side of the base of the dorsal and anal; whilst in *Capros*, the body is clad with scales, and there are no filaments to the dorsal and no spines at its base. I wish one could discover some preservative fluid that would conserve the colour in fish; few would realise, in looking at the pale specimens in the jars the exquisite rosy tint of the living fish. For the benefit of fellow-readers of SCIENCE-GOSSIP who preserve fish, I may mention that after trial of many preservative fluids, the one I find handiest and most useful is Burnett's fluid (chloride of zinc) largely diluted: i. e. 1 part of fluid to 20 of water. This solution is slow in evaporation, and of course does not crystallize about the mouth of the jar or bottle. I believe it is the fluid used in the British Museum for preserving fish.—*E. B. Kemp-Welch, Bournemouth.*

MISTAKES OF INSTINCT.—I desire most cordially to support the suggestion in your April number, to study the aberrations of instinct, as a means of arriving at a more intimate knowledge of the normal workings of that faculty. It is in fact the proper application of the philosophical axiom "Exceptio probat regulam" in its true sense. It is analogous to the study of monstrous forms in animal or vegetable structures (Teratology) in order to arrive at a knowledge of the mode in which the ordinary forms are produced. I would instance the *Arum Dracunculus* (the dragon flower) the flowers of which when fully expanded have a smell very much resembling that of putrid meat, and I have often noticed the multitude of flesh-flies that buzz and hover about the plant when in flower; attracted, as is very obvious, by the odour of the blossom. I learn from a notice in your April number, that Cuvier has stated that flies are so far deceived by it, that they actually lay their eggs in the floral envelope.* I have never yet observed this myself, but I have a plant in my garden, which in a short time will be in flower. And I will carefully

watch it, and if I find that any of the multitude of flies that visit it have laid their eggs in it, I will send the piece so operated upon to you, as a tangible proof of a decided mistake of instinct, in a matter of the utmost importance to the creature, and conclusively shewing that in this particular instance the animal is guided by the sense of smell alone, and does not correct its inferences by the application of sight or touch or any other sense to the object.

Probably anglers could do good service in this direction, if they would carefully observe, and note, under what circumstances fishes are most readily deceived by, or reject the allurements of artificial flies. Is there any reason to believe that they are guided by any other sense than sight, in snapping at the sometimes not very close semblance of a dainty morsel? Another instance that occurs to one is the common case of a hen being induced to sit upon a chalk egg; where sight and touch appear to combine to delude the poor creature. The point requiring observation, I think is—do not all the observed aberrations of instinct arise from mistaken sense? Is there any observed instance shewing that the creature is able to correct a mistake of sense, by the application of any other faculty, and if so, what is that corrective faculty?—*C. B.*

BOTANY.

FUNCTION OF NECTARIES IN PLANTS.—It is stated in the "Times" of April 8, that the theory of the functions of the nectary has recently been called in question by M. Bonnier, in support of which he gives various arguments. I was so much pleased with the (to me) convincing proofs adduced in "Flowers," by the Editor of SCIENCE-GOSSIP, that I hope his opinions, which are in accordance with those of Darwin, Müller, and others, will be confirmed by the discussions that will no doubt take place, refuting M. Bonnier's difficulties and objections, by botanists who have given attention to the subject; and I trust that some of them may appear in SCIENCE-GOSSIP.—*T. B. W., Brighton.*

CORN COCKLE (*Lychnis* or *Agrostemma Githago*). In January 1878, I received a few specimens of this plant from my friend Mr. J. Leighton, so much smaller than the ordinary form that I was not sure whether to consider them a new variety or merely starved specimens. So I sent one or two to Dr. J. T. Boswell for his opinion, and he kindly informed me that they were probably starved plants of *L. Githago*, and that if their seeds were sown in good soil they would doubtless produce the typical form. So I labelled my mounted specimens as a "starved form of *L. Githago*." But as Mr. Leighton in November last again forwarded me precisely similar examples from the same locality gathered last season, I wrote to him that the plant might perhaps be a new variety,

* See Taylor's "Flowers: their origin, shapes, perfumes, and colours," page 261.

and suggested the provisional name of *parvula*, to distinguish it in the meantime from the common form. Dried specimens differ in the following particulars:—*L. Githago*: stem branched 2' to 3 feet high; calyx segments nearly twice the length of the petals; flowers purple, whitish within the throat. *L. Githago var. parvula*: stem simple, 3 to 5 inches high, calyx segments equalling or shorter than the petals, flowers bright red. The difference in the colour of the flowers may have occurred in drying. The locality given for the plant is "near the Grand Stand, Epsom Downs, Surrey," and it might be worth while for some of our southern botanists to try and procure its seeds during the ensuing summer, see if it retains its characteristics when cultivated, and give the result of their experiments in the pages of SCIENCE-GOSSIP.—*D. Douglass*.

TERATOLOGICAL NOTES.—From observations made in my own garden, I am far from thinking synanthly commonly the accompaniment of decaying vital energy in the plants on which it occurs. Last spring I had a polyanthus which, after bearing a profusion of bloom, produced a flower with two pistils, each of them having a distinct style and stigma. This plant is now alive and vigorous in full bloom, many of its flowers being on long pedicels, growing singly like those of the primrose, others being in umbels on erect peduncles, as is usual in the polyanthus; and with nothing at present like that exceptional flower of last year. I have, however, now in bloom, several healthy, vigorous plants of polyanthus bearing synanthic flowers of which all the organs are double the number found in nominal flowers: from the calyx with ten teeth to the two long styles with well-developed stigmas, of which I enclose a specimen. All these flowers are pin-eyed, and most of them such as a florist would destroy. Indeed, I think that if botanists would pick up what gardeners throw away, and cultivate worthless varieties of popular flowers, they might know much more of teratology than many of them do.—*John Gibbs*.

A SHOWER OF POLLEN.—A remarkable shower of pollen grains fell in the north-eastern part of Pennsylvania on the morning of March 17, which covered an area of more than 2500 square miles. It is believed to be chiefly the pollen of *Pinus Australis* of the Southern States, and that it had been carried by the wind a distance of 500 miles. The country people took it for a "shower of sulphur."

YEW-TREES AND CATTLE.—With reference to this matter I beg to state that two stirks, the property of the Rev. D. Bonallo, Blackford, were found dead in the byre one day last week (end of April). It was discovered that they had devoured some cuttings of yew, which had been carelessly thrown out of the shrubbery into the meadow in which the cattle were grazing.—*R. Donaldson, Glasgow*.

GEOLOGY.

THE SILURIAN DISTRICT OF RHYMNEY AND PEN-Y-LAN, CARDIFF.—This is the subject of a paper recently read before the Geological Society, by W. J. Sollas, F.G.S.

The paper commences with a history of the previous observations on the district; a description of the geographical distribution, geological structure, and vertical succession of the Silurian rocks is next given. They comprise beds belonging to the Wenlock and Ludlow groups, and pass conformably upwards into the Old Red Sandstone. The district affords a good base for a measurement of the thickness of the Old Red Sandstone on the south of the South-Wales coalfield. This was found to be a little over 4000 feet. The thinning out of the Old Red Sandstone and Silurian strata, together with the marked change which takes place correspondingly in the lithological characters of the latter formation on passing from the north to the south side of the coalfield, were taken to indicate an approach to a shore-line. The shore-line belonged to land which, as shown by the great thickness of the Devonian beds, could not have extended far south. It corresponded to Mr. Etheridge's barrier between the Old Red Sandstone and Devonian seas. The sandstones with Old-Red characters, such as the Hangman Grit and the Pickwell-Down Sandstones, occurring in the Devonian formation, were deposited at intervals when this barrier was submerged to a greater depth than usual. The Cornstones were stated to thin out to the south along with the other sedimentary beds of the Old Red Sandstone, and were regarded as derived from the denudation of previously upheaved limestones, such as the Bala and Hirnant.

AN INDIAN MIOCENE APE.—The skull of an anthropoid ape, an adult female, which must have been as large as a female gorilla or orang, has been found in the Siwalik rocks of the Punjab by Mr. Theobald, of the Indian Geological Survey. It is the first of its kind found in India which bears a resemblance to existing apes; and this animal must have been as distinct as the gorilla and the chimpanzee, or any other two types of ape. It is proposed to call it *Pulicopithecus*.

POST-GLACIAL ANIMALS IN LONDON.—Fossil remains of various extinct animals have been recently found in London, in making the excavations for Messrs. Drummond's new bank at Charing Cross. They include elephant tusks and molars, probably the mammoth *Elephas primigenius*, teeth and numerous bones of the gigantic extinct ox (*Bos primigenius*), a portion of what appears to be the horn of the great extinct Irish deer (*Megaceros Hibernicus*), along with various other remains of ruminating animals not yet identified. All the remains are those of herbivorous quadrupeds, but

there is among them no bone or tooth of hippopotamus or rhinoceros, though these animals are known, from discoveries made at Brentford, Crayford, and other localities in the Thames Valley, to have been in post-glacial times the companions of the Thames Valley Mammoths.

"CONODONTS," ETC.—At a recent meeting of the Natural History Society of Glasgow, Mr. John Young, F.G.S., exhibited a series of conodont remains and sponge spicules from the Silurian and Devonian limestone strata of England, forwarded by Mr. John Smith, Kilwinning. Mr. Young stated that at a former meeting Mr. Smith had sent for exhibition an interesting series of conodonts and various forms of sponge spicules, which he had found in the limestone strata around Dalry, Ayrshire. Since that time he had visited several districts in England, and had been successful in discovering the remains of conodonts in some of the weathered shales and limestones of the localities he had visited, these not having been formerly noted as occurring either in the Silurian or Devonian formations of England. Very little is yet known of the nature of the organisms that have yielded these conodont remains, which consist of small teeth, joints, &c., of many different forms, one party referring them to the jaws of Annelids, another to that of Myxinoid fishes, to the lingual armature of certain forms of Molluscs or the maxillipeds of Crustacea. As new localities are turning up where these interesting though obscure forms are being found, it is to be hoped that more light will soon be thrown upon the true nature of the organisms to which they formerly belonged.

HISTORY OF MINERAL VEINS.—Mr. John Arthur Phillips, F.G.S., in a paper on this important subject, read before the Geological Society, described the phenomena of the deposition of minerals from the water and steam of hot springs, as illustrated in the Californian region, referring especially to a great "sulphur bank" in Lake county, to the steamboat springs in the State of Nevada, and to the great Comstock lode. He noticed the formation of deposits of silica, both amorphous and crystalline, enclosing other minerals, especially cinnabar and gold, and in some cases forming true mineral veins. The crystalline silica formed contains liquid-cavities, and exhibits the usual characteristics of ordinary quartz. In the great Comstock lode, which is worked for gold and silver, the mines have now reached a considerable depth, some as much as 2660 feet. The water in these mines was always at a high temperature, but now in the deepest mines it issues at a temperature of 157° Fahr. It is estimated that at least 4,200,000 tons of water are now annually pumped from the workings; and the author discussed the probable source of this heat, which he was inclined to regard as a last trace of volcanic activity.

ANCIENT PRAWNS.—Mr. Robert Etheridge, jun., F.G.S., has announced the discovery in the Lower Carboniferous bed of the south of Scotland, of a long-tailed decayed crustacean, or prawn, which he has very properly named after Dr. Henry Woodward, *Anthrapalemon Woodwardi*. Another species of *Anthrapalemon* was named *Macconochii*, after its discoverer.

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—"Idea" hopes to see a more intelligible distinction shown between instinct and reason, though by the context he evidently appreciates that there is a difference, and compares instinct in animals with impulse in man. By instinct I understand that intelligence with which animals are endowed, which causes them to act in a uniform manner without experience. Thus, for example, the beaver, the ant, and the bee, build their homes on a regular, and, so to speak, systematic plan, without, as far as can be learned, being taught by their progenitors. They have also an innate dread of their enemies, which appears to exist independently of experience. The origin of reason, as has been pointed out by Mr. P. Q. Keegan, is the subject of dispute by different schools of metaphysicians, which will apparently always be the case. We all, however, possess the faculty in some degree, and its practical workings are therefore pretty well understood. Even if it be granted that animals reason to a limited extent, the question arises, Is there no difference between man's reasoning power and that of the lower animals? The arguments of those who maintain that the intelligence of animals differs from that of man only in degree, are summed up in an assertion Darwin makes in "The Descent of Man": "Since animals possess the same senses, it follows they must possess the same fundamental intuitions as man." That man derives all his ideas from the senses has been disputed by so many writers of great capacity, that it would argue some presumption to consider it an axiom. As the concise proposition cannot be proved, it may, however, be true, and, if so, it follows, if Mr. Darwin's argument is sound, that all animals, without exception, which possess the same senses as man, are possessed of the fundamental intuitions. Why, then, does he draw a distinction between instinct and reason? and between conscious and unconscious intelligence? for proof of which see my letter of March, with quotation; and why, moreover, does he draw a distinction between the primates and the lower animals? The accounts of the actions of ants, as described in the "Origin of Species," and more recently by Sir John Lubbock, are more extraordinary than those of an ape. The brain of the ant is said to be large in proportion to its body, but it is infinitesimally small when compared with that of the ape. With regard to the anecdotes of animals in Mr. Darwin's work, and those which have lately been discussed in "Nature," we arrive with certainty at one conclusion, viz., that more than one explanation may be given of them. Those who argue that the intelligences of man and animals differ only in degree, have to prove, not only that animals agree in some parts of their mental powers with man, but in all; and here the distinction drawn by Mr. Henslow in "Nature," February 27, has to be explained between man's abstract reasoning powers and the reasoning of animals from objects present to the senses, which, it appears to me, has not been controverted. Here is one difficulty. Then with

regard to the imagination. Mr. Darwin derives the faculty from dreams, and observe that animals dream. Dreams are explainable by the theory generally accepted, that when we are asleep our intellect is partly awake, and when we are awake it is partially dormant. Doubtless the savage may occasionally mistake dreams for realities, though one would suppose their constant occurrence would familiarise him with the phenomenon. Surely this is a very slight basis on which to establish the origin of the faculty so marvellous as the imagination. That animals possess memory, attention, and sympathy, cannot be disputed. Will Mr. Rogers or Mr. Wheatley explain why they think "memory an act of reason?" How do they reconcile the assertion with the fact that idiots often possess marvellous memories? J. E. Taylor remarks on the mistakes made by animals, which he thinks may throw much light on animal psychology, and his letter suggests to me that the favourite method of illustration with the Darwinians is to compare the lowest savage that can be found with the most intelligent quadruped, and then remark that there is little or no difference between them, overlooking the fact that one is capable of development to an immense extent, and the other but to a limited degree. With regard to these cases of mistakes by animals, many swimmers must be aware that, when in the water, it is often difficult for them to keep their dogs off, they appear to wish to rescue their masters, and they do not always know their own masters when naked. I have known instances of naked persons being in danger from a dog and a cat, and I am informed that the maternal yearning of a cow that has lost its calf may be entirely satisfied by a skin stuffed with straw. There are also many instincts to which we have no clue whatever. All these must be explained before it can be conceded that the minds of animals and man differ only in degree. Turning for a moment from the mental to the physical question, which inevitably suggests itself, we find that Mr. Darwin compares the fetus of a man, a monkey, and a dog, and remarks that at an early stage of development they are apparently the same, and argues from this resemblance that they must have had a common progenitor. Despite this seeming resemblance, however, there is the indisputable fact that they develop into a man, a monkey, and a dog. Surely, if this proves anything, it proves the danger of reasoning by analogy, and Mr. Darwin's arguments are of this nature. The appearances explained by the law of reason may be as fallacious. I am not in the least prejudiced against the Darwinian hypothesis; whatever the conditions of our existence we must perforce submit to them; the question for me is, Can it be confirmed by facts? but no thinker can disregard the instinctive disgust with which it is regarded by many persons of all degrees of cultivation.

What do the evolutionists, who argue that some supernatural change may have taken place in the reason of man, mean by the word supernatural? If they mean some law not as yet discovered, why do they not suspend their judgment? If they mean a direct interference of the Deity, it is a purely speculative idea, without proof of any kind. We are not bound to explain the origin of species, or of man, but we are bound to examine any explanation that may be offered under penalty of being led on a delusive voyage of discovery. Much first-rate talent is being spent on deductions from the Darwinian hypothesis. What if the premisses are false? The finite cannot comprehend the infinite; so far I agree with your correspondent, C. L. W., but when he deduces from this fact that "man may consequently be in error when he assumes that he alone is the possessor of

reasoning powers," he suggests on this basis an assertion that may or may not be true. In my letter, in the April number, the words "the same kind of intelligence" are a misprint for "some kind of intelligence," the reverse of my meaning.—*H. D. Barclay.*

INTELLIGENCE IN MAN AND ANIMALS.—Mr. Wheatley quotes (from "Nature") a "remarkable instance of rats gnawing leaden pipes in order to obtain water, and which Dr. Darwin explained by saying that the rats heard the water trickling, and reasoned about it, and cut through the pipe to obtain it. I think this explanation probable." I believe it to be in the highest degree improbable. In this city the pipes are always full, and consequently no sounds of "trickling" could be heard; yet I know of more than one instance of pipes being gnawed by rats and mice, even the pipes conveying gas are sometimes bitten through, of which an instance came under my notice a few days ago. I think a much simpler explanation can be given than that the rats detected the presence of water and reasoned upon it, viz., that the pipes happened to be in their way.—*F. Killon.*

INTELLIGENCE IN ANIMALS.—"It is quite clear" (says Dr. Whately) "that if such acts were done by man they would be regarded as an exercise of reason, and I do not know why, when performed by brutes, evidently by a similar process *so far as can be judged*, they should not bear the same name. To talk of a cat having *instinct* to pull a bell when desirous of going out at the door . . . would be to use words at random." And I think many would agree with the learned archbishop if they would carefully read the testimony and researches of such eminent naturalists and thinkers as Locksley, Bacon, Burns, poet; Professors Darwin, Huber, Brehm, Rengger and Kirby; Cuvier, the naturalist; J. K. Lord, Lubbock, and the lately recognised genius, Edward, of Banff, &c. As an example, of which so many can be adduced, let us take the incident related by Mr. Edward. He saw two birds vainly trying to turn over a large fish on the sands, to get the vermin beneath. After many futile attempts, extending over half an hour or more, and after attracting a third bird who helped them to no purpose, they stood together, and apparently by their noise were engaged in some mysterious process of conversation and reasoning. They again set to work and dug a large hole in the sands from one side of the fish, even to undermining a certain distance, and then with evident expressions of triumph, rolled it over with ease and commenced the feast they had worked for. That fish measured 3½ feet, being a fine cod, and those birds undoubtedly used their reason to elaborate a scheme to accomplish their object. Without running off into Darwinian theories, I would remind Dr. Keegan, as he lays so much stress on the capacity of the brain, that one of our great physiologists tells us "that every chief fissure and fold of the brain of man has its analogy in that of the orang," whilst Huxley adds "whilst in those things in which the brains of men and apes do differ, there is also a great difference amongst various men." It is true structure is not all—the machinery may be perfect in every detail, yet if it lack the motive power of what avail is it? Still is it not reasonable to suppose that structure being so similar, God intended the ape to use her brain like man's but in a less degree? The chief obstacle to belief in reason in animals lies in the fear of what the admission may lead to, but surely we need not grudge these poor brutes the possession of a feeble development of reason, when man, and man alone, can thank his Creator for giving him a hope of a future which no animal is destined to enjoy.

BIRDS AND THE HARD WEATHER.—The various notes which have appeared on this subject have been read with much interest by us, especially Mr. Bingham's paper, *SCIENCE-GOSSIP*, page 70. We also, during the long severe winter, just experienced, have diligently fed twice a day our poor feathered friends; very delightful and pleasant it has been to watch the instinctive knowledge, almost amounting to reason, which appeared to bring them at the exact time their food was regularly put out for them. At the first appearance of the frost and snow, about the end of November, we had not only large numbers of sparrows, robins, and tom-tits, but also a good gathering of blackbirds, male chaffinches, and thrushes; eagerly they assembled on the trees to watch for the first crumbs thrown out, their bright, intelligent eyes quickly detecting the breakfast or dinner on the table. Soon, however, the cold of our northern climate was too severe for the thrushes, and about the middle of December they quite left us, but not before two of their number came to an untimely end: one was caught by the cat, its poor wings being too much frozen to fly away from pussy's reach, the second came into the house, as if to ask for help, but before it could be given it fell down dead. Both were evidently not only frozen, but starved to death. As the cold weather continued, we had, about Christmas, the magpies and rooks, in addition to our other birds. The rooks gradually increased in numbers each day, until on one occasion thirty-one were counted on the trees. Their favourite food appeared to be meat; we threw out some fowls' bones one morning, which seemed to be a great treat to them, for they carried away both the flesh and the bones. In the early part of December we had the starlings, but they soon left us, and have only recently (March 2) returned to us. Also on that day four thrushes again appeared, and regaled us with their sweet, thrilling song. It may not be without interest here to remark that we believe the thrushes do not leave England, but the late severe winter has driven them south. A lady friend living in Buckingham, who has been feeding the birds this winter, told us in a letter that she had twelve thrushes each morning. The blackbirds have remained pretty much with us, though they have been, with other small birds, greatly thinned by our neighbours, during the frost and snow, amusing themselves by shooting our valued feathered friends. And most cruel it appears, so to take advantage of their half-starved state, especially as they have come to us in confiding trust to have their unspoken wants relieved! The fieldfares have been numerous, and the heron has been seen flying over this neighbourhood, rather an unusual circumstance. We also were visited by a rat, which not only partook of the food thrown out for the birds, but burrowed close to the window. We were not quite so kind to him as was Mr. Bingham to his rat, for we set a trap, which, though it was not strong enough to secure him, had the effect of driving the poor fellow to seek a home elsewhere.—*Elizabeth Edwards, Stoke, Stafford.*

CUCKOO'S VISITS.—It may be interesting to know that during the last summer and for the preceding four or five years, I have noticed a cuckoo frequenting this locality (a suburb of London). I have seen it repeatedly upon the trees overhanging and adjoining my small garden, and upon one occasion it remained perched upon a rail in front of my fowl-house for more than half an hour. I cannot say positively that it was the same bird, but it was (or they were) always small, and as cuckoos vary considerably in size (I have shot many) I have no doubt that such was the case.—*J. L. Erixton.*

THE CUCKOO'S EGGS.—Having had a good deal of experience with regard to cuckoos and their eggs, perhaps the following remarks, the result of my own observations, may not be without interest to "Junior" and others of your correspondents. My experience agrees with that of the writer in the April number, p. 95, for out of all the numbers I have discovered I never took one from a nest built on the ground. With one exception, to be mentioned presently, I found them all in the nests of the hedge-sparrow and wag-tail. Those from the latter were generally similar to the eggs in the nest (but larger of course), and had streaks, and not spots. The exception to which I have referred just above was one taken from a common wren's nest, which was built in furze placed in hurdles in order to make jumps for horses. This egg was smaller than any other cuckoo's which I have seen. There were six wren's eggs in the nests with it. I have never found more than one egg in the same nest.—*F. Anderson, Chichester.*

BLACK BULLFINCHES.—Hemp seed will, I know from experience, darken the plumage of most birds, and bullfinches are especially liable to change colour if much of this seed is given to them, although they are particularly fond of it. I had a bullfinch that turned black in the same way as "St. Austell" describes his to have done, but my bird did not lose his vocal powers, and was in perfect health. I saw a black bullfinch not long since in a cottage window, and went in to ask the mistress, who keeps a village shop, if she gave the bird hemp seed, but she said it had grown up black. She had taken it, I discovered, from the nest, and its plumage had from the first been black.—*Mrs. Alfred Watney.*

TREE SPARROW.—In looking over some odd numbers of an old periodical, I saw a short account of this bird. Amongst other particulars, it stated that it had only been found breeding in seven English counties; and as I have frequently found it nesting here (North Yorkshire), I thought the following notes concerning it might not prove uninteresting to the ornithological readers of *SCIENCE-GOSSIP*. It most usually constructs its nest in the hollow parts of trees, especially where a hole has been formed by the breaking away of a branch. But this is not invariably the case, for in the year 1876 I found a perfect colony of them nesting in the roof of an implement shed attached to a farm. There had been a heap of thorns laid upon a few cross beams, and upon these the usual thatch of straw had been laid. It was in the thorns that the nests were found. There were over a dozen of them, besides several of those of the house sparrow; and all of them contained either eggs or young. On revisiting the place again last year, I only found one or two nests, all the "good holes" being apparently occupied by the house sparrow, to the exclusion of its smaller relative.—*J. A. Weldon, North Allerton.*

CURIOUS SITES FOR BIRDS' NESTS.—Your correspondent on the above subject does not mention the prolific site that an old magpie's nest affords, and the number of birds that make use of it after the original builders have done with it; from my own experience as a "birds'-nester," I have taken the eggs of kestrel, sparrow, hawk, brown owl, blackbird, thrush, starling, stock-dove, pied wagtail, redstart, nuthatch, creeper, great tit, blue tit, and once, built in the cross sticks of the dome, the nest of the long-tailed tit; when magpies were more plentiful than they are here now, their old nests were an almost certain find for stock doves, and many a pair of eggs and young have I taken from them.—*G. T.*

PLATES OF BIRDS' EGGS.—Could any reader of SCIENCE-GOSSIP inform me whether there are any tolerably cheap, but good coloured plates of British birds and eggs, or eggs separately, and if so where obtainable?—*T. J. W. Oakley, Stoney Cross, Bournemouth.*

A STRANGE PLACE FOR MARSH PLANTS.—Had not Mr. A. Craig-Christie's remarks (p. 16) appeared to require some comment, I would not have reverted to this subject. But as he says all the plants in the list "are to be found all along the coast from Bowness to North Berwick (in damp and marshy places)," and as this includes Leith and its neighbourhood, any one who has not an opportunity of examining the place, will naturally infer that they have sprung up from the seeds of plants in the immediate vicinity, and that, far from being unusual, their speedy appearance is only a natural sequence of the exclusion of the salt water. But this is not the case. The Leith and Portobello branch of the North British Railway runs close to the shore for about a mile east of the town, and is bounded on the north by a sloping sea-wall, that was formerly washed by every tide, and on the south by the turnpike road between Leith and Portobello; this again being bounded by dwelling-houses, gardens, and fields. So it will be seen that hardly any vegetation, other than marine, could or did grow there. Again, Mr. Christie says:—"Most of them used to grow at the Figgat Whins, between Leith and Portobello." It may be so; but both they and the Figgat Whins have long disappeared, and of fifteen species observed, only three, namely, *Ranunculus sceleratus*, *Veronica beccabunga*, and *Catabrosa aquatica* are now found between the two towns, a distance of three miles; so far as I can see, after a careful examination of the coast; while between Leith and Granton, about an equal distance in the opposite direction, none of them are found at all. As my previous note was forwarded in July, a few additional species were subsequently observed before their growth was finally stopped by autumnal frost. And several littoral species, not recently found near Leith, also made their appearance. Among these I may mention *Aster tripolium*, *Salicornia herbacea*, *Triglochin maritimum*, *Juncus Gerardi*, and *Scirpus maritimus*. All these were probably at one time common here, till their gradual extinction from alterations made on the coast, through the exigencies of trade and commerce. In conclusion, I have recently received information that appears to afford a satisfactory explanation of the matter. A native of Leith tells me that the overflow water from Lochend Loch at one time entered the Firth at the place where the plants now grow, but that several years ago it was drained away in another direction, and now runs into the Firth much farther eastward.—*D. Douglas.*

INTERESTING PLANTS IN THE ROYAL GARDENS, KEW.—On the west-side of the Economic house is *Schinus Molle*, the Peruvian Mastic, introduced into this country about 1597, and included in the natural order Terebinthaceæ, tribe Anacardiæ, of Hooker's "Genera Plantarum." It is a small dioecious shrub with unequally pinnate leaves, and white flowers in panicles. The cells in the leaves contain a great quantity of volatile oil or resinous matter, which is violently expelled if the leaves be placed in water, the recoil causing a motion that appears to be spontaneous. In Italy, where this plant succeeds well in the open air, a shower of rain renders the air fragrant with the discharged oil. The young leaves of several species of *Rhus* exhibit the same phenomena when immersed in water. The Peruvians employ the roots

as an astringent medicine, and in Chili a kind of wine is prepared from the fruits. *Schinus* is the Greek term for *Pistacia Lentiscus*, and was applied to the present plant from the similarity in their medicinal properties. The specific name *Molle* is not the neuter form of *mollis*, as might be supposed, but an adaptation of the native term *Mulli*. On the same side is the notable manchineel (*Hippomane Mancinella*) found on the sandy shores of tropical South America and some islands in the West Indies—a Euphorbiaceous tree, with ovate-elliptical shining leaves, and inconspicuous unisexual flowers. The milk-white juice of this plant has a volatile poisonous principle; which, however, is not sufficiently virulent to render credible the innumerable marvels related concerning its effects. The manchineel is said to rival the upas-tree of Java in the number of wonderful tales with which it is connected. We have reliable evidence of one property in the works of Dr. Leeman, who states that he and some sailors were affected by temporary blindness through getting some of the juice in their eyes, when on shore at Veraguas. The statement that persons have died through sleeping under the tree, was doubted by Jacquin, who judged from his own experience; but Ad. de Jussieu thought, very reasonably, that its effects might vary on differently constituted persons. The fruit is fleshy, and closely resembles an apple in shape and colour, but as it contains the same noxious principle as other parts of the plant, we can readily imagine what an extremely disagreeable surprise would greet the unfortunate individual who might attempt to eat it. The name *Hippomane*, from *hippos* and *mania*, was given by the Greeks to a plant that grew in Arcadia, which had the reputation of rendering horses furious. At the other side of the house we have *Physostigma venenosum*, the "ordeal bean" of Old Calabar; a leguminous plant included in the Phaseolæ. It has a climbing stem with alternate, pinnately trifoliate, stipulate leaves; the leaflets acuminate, and base of the common petiole swollen; the purplish flowers are borne on pendulous axillary racemes. The style is very long, bearded, and tapering, to near the apex, where it is broadly dilated into a triangular hood above the stigma; from this peculiarity the generic name and character are derived. Although valuable nutritive qualities characterise leguminous plants generally, yet a deleterious principle occurs in several species, and in none is it more strongly marked than in *Physostigma*, which is certainly the most poisonous of this vast order. The active properties are concentrated in the seeds, and are found to be owing to the presence of the alkaloids eserine and physostigmine. The seeds are used by the natives of west tropical Africa as an ordeal, similarly to the Tanghin described in the last paper. The extract and alkaloids have a peculiar effect upon the eye, causing contraction of the pupil; hence, of late years they have become valuable ophthalmic medicines.—*Leavis Castle, West Kensington Park.*

"STOCK-FROST," &c.—What are the phenomena which go, in the Norfolk district at least, by the name of "stock-frost," "stock-ice?" I have heard men whose veracity is unimpeachable, and not unintelligent men either, assert that in certain frosts the bottoms of streams and "broads" will freeze, and at the giving of the frost, a substance something like ice-cream in appearance will come to the surface, this substance having imbedded in it the weeds that grew near the bottom of the water, and often the stones and brickbats that might be resting on the mud. I don't understand the phenomena, but if those who know would kindly insert an answer to my query, they would much oblige.—*Ignoramus.*

"HONEY-STALKS."—It is generally supposed that the writer of "Titus Andronicus" referred to clover flowers in the lines quoted by C. Foran. The long tubes of the corolla in the flowers of *Trifolium pratense* abound in honey. It is, I believe, an error to suppose that the clover flower produces rot in sheep, though the author of "Titus Andronicus" leads us to suppose so, as the lines concerning the "honey-stalks" seem to show :

"With words more sweet, and yet more dangerous,
Than baits to fish, or honey-stalks to sheep;
When as the one is wounded with the bait,
The other rotted with delicious feed."

I may here remark that the play "Titus Andronicus" is very generally believed not to have been written by Shakespeare at all. I think I am right in asserting that in modern editions of Shakespeare this play is omitted as spurious.—*Charles F. W. T. Williams, Bath.*

"HONEY-STALKS."—(No. 173, p. 118) : the flowers of white clover (*Trifolium repens*, L.). It is an interesting fact that this is still the local name of the plant in Shakespeare's native country.—*Robert Holland.*

"HONEY-STALKS."—Nares in his Glossary quoting the passage from Shakespeare's "Titus Andronicus" referred to by your correspondent, C. Foran, says "honey-stalks" are clover flowers, which contain a sweet juice, and that it is common for cattle to overcharge themselves with clover and die. I may add that country children often suck the flowers for their sweet juice, which they call honey.—*W. Thompson, Sudburgh.*

"HONEY-STALKS."—I find under this head in Nares' "Glossary of Shakespeare," "Clover flowers, which contain a sweet juice; it is common for cattle to overcharge themselves with clover and die." I hope that this explanation will satisfy your correspondent.—*F. A. Bather.*

COSSUS AT SUGAR.—In answer to the query in May number of SCIENCE-GOSSIP, I may say that in July 1876 I saw a specimen of the above insect on sugar at Willans, near Lea Bridge, Hackney, but it flew off the tree immediately the light came upon it. The same incident occurred last year, but I was unsuccessful in bottling the insect, which was a very shabby specimen. However, the next night he paid us another visit, and we captured him, but owing to bad condition gave him his freedom. I also met a collector who had a freshly-emerged specimen which he assured me he took at sugar, at the same locality.—*Arthur J. Rose.*

COSSUS AT SUGAR.—Your correspondent, W. H. Newberry, inquires for instances of *Cossus ligniperda* coming to sugar. A few summers ago I took a specimen near Semley, Wilts, in an oak-tree which I had painted with a mixture of treacle and beer, it crawled up from the ground to the first drop down the base of trunk; this, however, is the only occasion I have noticed the species attracted by sweet fluid.—*H. P. Stock.*

ABNORMAL CHARACTER OF THE SEASON.—It may be worth putting on record that this year the palm-tree, and the blackthorn, only began to blossom in this neighbourhood on May 2. According to the Rev. L. Jenyns, the flowering of the former tree ranges from March 17 to April 19, as that of the blackthorn from March 15 to April 20. The return of birds of passage has been little affected. Swallows were first seen here on April 20, and the cuckoo was first heard on April 25, dates by no means exceptionally late. This

fact disproves the old notion that migratory birds have a mysterious foreknowledge of the state of the weather in the country to which they are going, and time their movements accordingly.—*J. W. Slater, Aylesbury.*

SLEEP OF ANTS.—I should be obliged if any of your correspondents could give me the following information. Mr. Emerson in chapter iv. (entitled "Language") of his essay on "Nature" says: "The instincts of the ant are very unimportant, considered as the ant's, but a moment a ray of relation is seen to extend from it to man, and the little drudge is seen to be a monitor, a 'little body with a mighty heart,' then all its habits, even that said to be recently observed that it never sleeps, become sublime." What I wish to know is whether there is any evidence to prove that the ant never sleeps? I should be much obliged if any correspondent can give me this information.—*S. T.*

THE THERMAL SOURCES OF CARLSBAD.—I am very glad to see in the SCIENCE-GOSSIP recently, that a local cause for hot water has been discovered at Carlsbad. Will you allow me to offer you a quotation from my "Interior of the Earth," 1870, "Hot Springs" p. 51? "It is sufficiently proved by the analysis of the waters, that the materials carried with them are conducive to heat. As then these trickling subterranean waters work downwards, they come to the materials which had long ago been subjected to the natural heating causes; these materials gathered over, and upon the faces of the harder strata, offer themselves to the perpetual erosion of every trickle, so that the alluvial valley is kept perpetually supplied with the bases of the metallic alkalis, with water to create the heat, and with the acids to modify that heat." The cause of heat in all hot springs is local. It has suited science to assign the cause to a hot interior, founded on the nebular hypothesis of Laplace, but this is not proved, while the local cause for hot springs is proved.—*H. P. Malet, Florence.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

E. J. OCKENDEN.—See chapter in "Collecting and Preserving Natural History Specimens" (London: Hardwicke & Bogue, price 3s. 6d.) It is written by Professor Ralph Tate, and gives you full instructions for removing mollusca from their shells. Gwyn Jefferys' "British Conchology," published by Van Voorst, is the best work we have on this subject.

A. SEINAD (Colchester).—Get Taylor's "Aquarium: its history, principles, and management," price 6s. London: Hardwicke & Bogue; where you will find full instructions as to the details you enquire about.

L. HAWKINS.—We have forwarded your specimens to be named, but you could easily identify and name them for yourself, by getting Cooke's "Microscopic Fungi," price 6s., from Hardwicke & Bogue, 192 Piccadilly, W.

J. R. CORNER.—The common cray-fish (*Astacus fluviatilis*) can be kept in aquaria. Its food consists of aquatic mollusca, insect larvae, &c., and the cray-fish would even be useful in a large aquarium, in consuming and removing dead garbage. See an account of a domesticated cray-fish in Bell's "British Stalk-eyed Crustacea." The smooth newt (*Lissotriton punctatus*) is soonest adapted to an aquarium. Mr. King, Sea Horse House, Portland Road, London, could supply you with material and objects for aquaria.

E. VILES.—The "slimy substance" on the gravel paths was no doubt the *Nostoc commune*.

M. W. T. (Cardiff).—Get "Notes on Collecting and Preserving Natural History Specimens," price 3s. 6d. published by Hardwicke & Bogue, 192 Piccadilly, London, and study chapter on "Botanical Specimens," by James Britten, F.L.S.

G. C. D.—You do not say what kind of objects you wish to mount. Canada balsam can be used in India, but requires hardening by heat before putting on the cover glass.

EDWARD WARD.—Your fresh-water algae are—1. *Zygnema rivularis*, Hassall; 2. *Zygnema* (? sp.); 3. *Z. nitidum*; 4. *Vesiculiferia Candollii*, Hassall.

J. B.—Your mounted specimens are,—1. *Lyngbia* (? sp.); 2. *Rivularia granulifera*; 3. *Rivularia*.

F. S. ST. A.—If our correspondent will send us isolated specimens of the algae she wishes to have named, we will endeavour to get it done, but we cannot ask those gentlemen to whom we are indebted for the identification of specimens, to search over a quantity of crude material, in order to find some particular form, and to which no clue has been given.

J. SEEVERS.—Our "Exchange column" is open gratuitously to subscribers of SCIENCE-GOSSIP for their mutual advantage, but we limit the length of the exchanges to about three lines of letter-press.

J. S. DICKIN.—Fritchard's "History of Infusoria" is an old and antiquated book, but the only one in our language before the public. It is rare, and can only be obtained through a secondhand bookseller. Mr. Saville Kent is, we believe, preparing a revised manual of "British Infusoria," a work long wanted. Slack's "Pond Life," and Gosse's "Evening's at the Microscope," are both good books for a young amateur.

W. ROBERTS.—Your specimens of weevil are *Otiorynchus picipes*. *O. sulcatus* is a distinct species, easily distinguished from the former. Both are destructive foes to gardeners, although the larvae of the latter have a peculiar predilection for potted plants.

BOTANICAL EXCHANGE CLUB.—Rules of membership, &c., may be obtained by application to 192 Piccadilly, W. It is time that intending workers should send in their names, addresses, and subscriptions, with a view to work this summer.

WILLIAM BENNETT (Cleghonger).—Your bat is a remarkable earless specimen of the common flutter-mouse (*Vespertilio pipistrellus*).

EXCHANGES.

A SPECIMEN of the rare shining moss (*Schistostegia pennata*), containing many diatoms, sent for really well-mounted slide.—T. Watson, Bank Parade, Burnley.

STEPHEN'S "British Insects," with coloured illustrations. I have the first four volumes of part i. (i.e. Mandibulata) and the first three volumes of part ii. (i.e. Haustellata) of the above work. Want remainder. Apply to George T. Baker, Hagley Road, Birmingham.

MICROSCOPE (Baker) in case with condenser, polariscope, &c. complete. For £15 or smaller instrument and cash. Also "Beale on the Microscope."—Rev. C. L. Williams, Aston, Birmingham.

AUTHENTICATED British, European, Asiatic, Indian, American, African, Labrador species bird's eggs. Lists forwarded. Exchange offers requested. Foreign correspondence specially wished for.—John William, 11 Priory Road, Sheffield.

FINE slides of the rare *Sphaeroplea annulina*, showing fructification, in exchange for other authentically named freshwater algae, or first class material, diatomaceous preferred.—J. Tempère, 249 Moss Lane East, Manchester.

WANTED, fossils, in exchange for sponges and fossils from the white and red chalk of Yorkshire; also recent shells, in exchange for British land, fresh-water, and marine species. Send lists to Rev. George Bailey, Seaham Harbour.

FOR unmounted palates of *L. litorea*, and *B. undatum*; send unmounted objects to J. M., 12 Porchester Street, near Clifford Street, Birmingham.

WELL-MOUNTED slides of *Aulacodiscus littoris*, *Aulac. margaritaceus*, *Heliopecten mollis*, *Trinacria regina*, several species of Hemiantus and Isthmia, and a large number of diatomaceous deposits from all countries for slides or gatherings of rare diatomaceae.—Otto A. Witt, 2 Gunnersbury Terrace, Turnham Green, London.

GOOD slides offered in return for insects, living or freshly killed, in spirit. More especially the less common Diptera, gadflies, sawflies, mole crickets, and other orthoptera and neuroptera.—G. N. W., 10 Edinburgh Place, Weston-super-Mare.

WELL-MOUNTED slides of anchor, and plates of *Synapta gallicrena*, in exchange for good unmounted material.—W. E. C., Mr. Greasley, White Cottage, Gregory Street, Old Lenton, Nottingham.

NUMBERS of "Astronomical Register," "Microscopical Journal," "Nature," and others, to exchange for British bird's eggs.—George W. Coultas, High Street, Bridlington, Yorkshire.

AM breaking up my noted collection of exquisite and rare exotic butterflies and moths. Also British coleoptera, 8000 specimens, 4000 species, mounted on cardboard without pins. Also bird's eggs. Full particulars sent. Wanted in exchange, European eggs. No post cards.—Henry Sissons, Brincliffe, Sheffield.

WANTED, unmounted material of all kinds, in exchange for microscopic or lantern slides, or cash.—Joseph Severs, Airethwaite, Kendal.

IN exchange for mounted sections of "Golden Osier" and holly-stems, double-stained, send good slides to A. Alletsee, 11 Foley Street, London, W.

"THE MICROSCOPE," by Hon. Mrs. Ward, new cloth gilt, for Suffolk on "Microscopical Manipulation," or Gosse's "Evenings with the Microscope," or Martin's "Manual of Microscopic Mounting," or Cook's "Rust, Smut, Mildew, and Mould."—A. C. King, South Parade, Ledbury.

OFFERS in exchange (either in foreign land, or foreign marine shells, the former most acceptable) for any of the following British land and freshwater shells, which I have duplicate specimens of at present—namely, *S. oblonga*, *L. involuta*, *L. Burnettii*, *P. ringens*, *V. pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, *V. Moulinsiana*.—W. Sutton, High Claremont, Newcastle-on-Tyne.

EXOTIC insects of every description from India, Peru, China, America, Java, Africa, Ceylon, &c., exchange arranged by letter. Foreign correspondence specially requested. Selections forwarded on approval, before exchanging.—Sissens, Sharrow, Sheffield.

LIVING water newt (*Lissotriton palmipes*) in exchange for living polyzoa, &c.—J. B., 36 Windsor Terrace, Glasgow.

WANTED, in exchange for fossils, seaweeds, and other natural objects, any old MSS. deeds, books, prints, &c., relating to Kent, Thanet, or Margate.—F. Stanley, Margate.

PATHOLOGICAL crystals, cystin, leucin, tyrosin, &c., in exchange for good mounted or unmounted objects.—J. W., 10 Evering Villas, Clapton, E.

SMALL packet of diatomaceous earth (Stoneyford, Ireland) sent upon receipt of stamped envelope; any object of interest will be thankfully accepted. I have some very fine selected slides of diatoms, some arranged in pattern, that I will exchange for fragments of *Hyalonema mirabilis*, or other good spicula bearing sponges.—W. White, 18 Convent Street, Nottingham.

OFFERED Hooker and Baker's "Synopsis Filicum," 2nd ed., coloured plates. Wanted, Sach's "Text Book of Botany."—Jephthah Makin, Pendlebury, near Manchester.

WANTED to exchange for rare plants, the *Gagea lutea*, and *Chrysosplenium alternifolium*.—George Hastwell, Darlington.

CORAL sections, British and foreign shells, fossils, minerals, and polished sections of madreporas; will take fossils, rough corals, and foreign shells in exchange.—A. J. R. Schlater, Teignmouth.

NEW'S eggs (living) in exchange for living polyzoa, melicerta, and similar objects. Send to J. B., 36 Windsor Terrace, Glasgow.

BOOKS, ETC., RECEIVED.

"Evolution, Old and New." By the author of "Erewhon." London: Hardwicke & Bogue.

"Electric Lighting, and its Practical Application." By J. W. Shoolbred, B.A. London: Hardwicke & Bogue.

"Organic Chemistry." By Hugh Clements. London: Blackie & Son.

Noad's "Student's Text Book of Electricity." Revised by W. H. Preece. London: Crosby, Lockwood & Co.

"Proceedings of the Literary and Philosophical Society of Liverpool," vol. xxviii., 1877-78.

"Entomological Papers." By C. V. Riley.

"The Silkworm;" being a brief manual of instructions for the production of silk. Washington: Government Printing Office.

"Midland Naturalist." May.

"Land and Water." May.

"Ben Brierley's Journal." May.

"Journal of Applied Science." May.

"Animal World." May.

"American Quarterly Microscopical Journal." April.

"American Naturalist." April.

"American Journal of Microscopy." April.

"Characeæ Americane." By Timothy F. Allen, LL.D.

Part I.

"Feuille des Jeunes Naturalistes." March.

"Bulletin de la Société Belge de Microscopie." February.

"Marine Engineering News." May.

&c. &c. &c.

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HOLIDAY RAMBLES.

GLEN CALLATER.

By G. C. DRUCE, F.L.S.



VERY different was the scenery and atmosphere of Deeside from that of Jersey, but the same attractive spell of botanical rarities hung round each, although the flora was as different as the atmosphere and scenery. Here, instead of headlands shining like opals from the profusion of *Sedum anglicum*, we had hills of dusky brown, in places flushing into ame-

thystine tints from the half opened heather, or darkened into sombre olive-green where the pines of Mar and Invercauld grew in rich luxuriance. But the point of most attraction, as we lingered about the gardens of the Fife Arms, or strayed by the Cluny side, was the road leading to Glen Callater, although such mighty rivals as Ben na Bourd, Ben A'an and Ben McDhu, all celebrated for their rarities, were around. So it was towards Glen Callater we first started, following for a time the river Cluny, gathering close to the hotel *Hieracium pronanthoides*—and admiring the little stream as it fell in tiny rapids down to the Dee, but after proceeding some couple of miles, the glimpse of snow on McDhu, now appearing over Braemar, gave new object for our admiration, till this gave place to the pleasure of seeing *Pyrola rotundifolia* and *Listera cordata* growing within a few feet of each other. The common plant of this portion of our walk was *Alchemilla alpina*; *Empetrum nigrum* later on, however, disputed its claim. Leaving the Cluny for its tributary,

the Callater, after some little time we noticed right ahead precipitous cliffs, down one of which was pouring a tiny stream, the far-famed "Break Neck waterfall" of Glen Callater, where some elderly botanist got into such a dangerous place that he dared not go down and could not go back, and was thus imprisoned for more than a day. The *Hieracium vulgatum* was common by the steep sides of the stream till shortly before reaching the loch; on more level ground, where the stream only slowly crept, it became bordered with bog plants, such as *Drosera*, *Pinguicula*, while in some of the more stagnant pools *Chara syncarpa* occurred, the quicker running stream yielding *Chara pulchella*.

The lake itself contained *Isoetes echinospora* and *Lobelia Dortmanna*. Here, six miles from Braemar, we commenced the ascent of Loch na Gar, gathering *Polygonum viviparum* and *Carex binervis*, and then were brought to a standstill by the abundance of *Tridentalis europea*, dwarfed to an inch or two in height, but with lovely large flowers. The ascent of the mountain is not particularly interesting, the best views being the corrie of Loch Kander and the waterfall, but several good plants were picked, among them being *Hieracium cesium* and *chrysanthum*, *Caltha minor*, *Sibbaldia procumbens*, and *Saxifraga aizoides* and *stellaris*, the two latter very common. At still higher elevation *Luzula spicata*, *Carex rigida*, and *Juncus trifidus* occurred, a great abundance growing among the stony débris, and then appeared the tiny *Salix herbacea* with its bright chestnut-red fruit, which with the three former continued nearly to the summit, from whence a splendid view was obtained over Deeside to Balmoral and Ballater, with the Scotch Alps Ben McDhu, Ben A'an, Cairntone, rather uninteresting in outline, being rounded and dumpy in appearance, and wanting the sharp peaks and fantastic outlines of Arran or Snowdonia; but still very beautiful were the snow patches appearing now a blue grey as some passing cloud obscured the sun and now shining with dazzling brilliancy; down below us was Loch Muick, while over by Glen Callater could be discerned the

black Loch Kander with its precipitous corries, the rocks at the head of Glen Callater, and above these appeared the hill forming the watershed of the Clova mountains. Descending to the snow corrie, where in the water running from the snow we got some saxifrages, we soon came to *Azalea procumbens* and *Epilobium alpinum*, and coming down by some roughish descent the ground near Loch Callater was covered with *Arbutus Uva-ursi*.

Another day was spent in walking from Braemar to Loch Callater, and following the western side of the lake, near the head of which we came upon *Veronica beccabunga*, dwarfed to a couple of inches, and with bright blue flowers contrasting beautifully with *Saxifraga aizoides*, with which it occurred.

On the moorland leading up to Loch Kander, *Carex pauciflora* and *Rubus Chamamorus*, the latter in flower, were gathered; by the stream issuing from the loch *Salix arenaria* and *Lapponum* occur, and in the lake itself grew *Callitriche hamulata*. The corries round the lake were rich with rarities, *Polypodium alpestre* being especially fine. *Rhodiola rosea*, *Saxifraga hypnoides*, with the varieties *gemmipara* and *sponhemica*, *Epilobium anagallidifolium*, *Alsine verna*, *Polygala vulgaris* approaching *grandiflora*, *Juncus trifidus*, *triglumis*, *Carex pulicaris*, *pilulifera*, and strange dwarfed specimens of *Carex flava*, and some fine *Asplenium viride*, were soon gathered. At some elevation on the precipitous rocks were gathered *Salix reticulata*, *lanata*, and *herbacea*, *Carex capillararis*, and abundance of *Cochlearia alpina*, *Saussurea alpina*, not quite in flower, and *Hieracium pallidum*, *chrysanthum*, *nigrescens*, and *caesium*. This dark lake Kander, like so many of our British mountain lakes, is situated on the east side of the mountain, and it is probable that their position may be owing to glacial action, the great amount of snow and ice remaining on the colder side. Lakes in this position are to be seen on Ben Nevis, Cairngorm, Loch na Gar, and in many of the Welsh mountains. In the Lake District the difference between the south-western and north-eastern sides of the mountains is very marked, and High Street, Helvellyn, Scawfell have also these mountain tarns on the eastern side.

To return, however, to the cliffs about Loch Kander, where some good scrambling was enjoyed in getting on to the rocks about the Break Neck waterfall, where magnificent *Juncus triglumis* and *Carex atrata* occurred. Then came a grassy place of a less steep inclination, where *Aspidium lonchitis* grew almost by hundreds; here too were found *Leontodon pratense*, *Carex alpicola* and *speirostachya*. By the waterfall grew *Veronica alpina*, not in flower but with a bluish purple about the capsule; the variety *montana* of *Alchemilla vulgaris*; the cudweeds *G. supinum* in both its states *pusillum* and *fuscum*; a form of *Carex binervis*, which at first looked like *frigida*, and *Salix nigricans*, *phylicifolia*, and *pseudo-glauca*; *Hieracium anglicum*, *Vaccinium uliginosum*, *Aira montana*.

Silene acaulis and *Saxifraga oppositifolia* both occurred in flower, although very sparingly. At the boggy head of the lake *Carex vesicaria*, *Potamogeton polygonifolius*, and other common plants occurred, but after such a feast of rarities our botanical ardour required stronger stimulus than these to linger on our homeward walk.

THE HYPOTHETICAL PLANET.

By J. J. PLUMMER, M.A., F.R.A.S.

THERE are few pages in the history of astronomy that will read more strangely in the future than the belief which has been entertained so firmly during the last twenty years in the existence of a planet interior to Mercury, and which is generally known by the name of "Vulcan." No doubt much of the tenacity that has been shown in this matter is attributable to the respect due to the genius of the late M. Leverrier, who had a profound belief in the reality of its existence, and than whom there was none other more capable of estimating the value of the evidence in its favour. He subjected, one after another, the motions of all the major planets to the test of the most refined analysis, and had shown in every case how accurately the law of gravitation accounted for all the minor disturbances (technically called perturbations) which the several planets produce upon each other by their mutual attractions. One, and one only, appeared to defy his treatment and the Newtonian law alike, and this, the planet Mercury, the smallest of the larger planets, and the nearest to the sun. The direction of its elliptical orbit is certainly shifting slowly, and the attractions of the neighbouring planets were by him deemed insufficient to account for the fact. No one had better reason to remember than Leverrier, how similar outstanding perturbations had been reduced to order by the discovery of the planet Neptune at the other extremity of the solar system, and it is, therefore, not surprising to find him confident that a like result would be achieved in this case. Indeed, so far as the theoretical side of the question is concerned, the case appears to be completely in favour of an undiscovered planet interior to Mercury, and the full weight of this evidence was doubtless not only felt, but exaggerated in the mind of the great French astronomer.

The difficulty of verifying practically these conclusions by the actual discovery of a planet is very considerable, owing chiefly to the close proximity to the sun which such an object would constantly maintain, and the only hope of bringing the telescope to bear upon the actual body would necessarily be during an eclipse of the sun, or on the occasions when the planet might project itself on the solar disc. There are not wanting records, more or less definite and precise, of the appearance of minute spots upon the solar orb unlike the well-known sunspots, but unluckily no practised astronomer has yet succeeded in securing a

glimpse of these strange objects, so very like planets *in transitu*. A number of them, some five or six, group themselves round a particular day in the month of March or October, in such a manner as to render it possible, at least, that they might be transits of the same body, for it is to be remarked that a transit of a planet can only be seen when the object is near one of the nodes of its orbit, that is, when it is crossing the ecliptic, and thus can only have place when the earth is in the same longitude as the node, or twice a year at an interval of six months. But now the difficulties begin to accumulate. If these five or six observations of spots be really transits of a single planet, it should be possible to predict the recurrence of like transits, and Leverrier, believing in the trustworthiness of five of them, did predict a transit of Vulcan for the month of March 1877. The supposed planet, however, failed to put in an appearance, and Leverrier died while the question was still unsettled.

Somewhat later M. Oppolzer has taken up the subject, and using eight observations of spots made at various times during the present century as *bonâ fide* transits of Vulcan, found that these could be reconciled by a second hypothesis differing considerably from Leverrier's, and which could readily be tested, as transits must occur very frequently, and he fixed the 18th March of the present year as one of these crucial occasions. Just as previously, however, astronomers in all parts of the world anxiously scanned the sun upon the day named, and met with the same ill-success. Probably this would have been the last attempt of the kind, and astronomers would have remained content with this negative evidence as proving the non-existence of Vulcan, but the question in the meantime had assumed a new phase.

We have stated that Vulcan should be visible in all probability to the naked eye, and certainly with the aid of small telescopic power during a total eclipse of the sun. Frequently as these phenomena have been observed of late years by the most experienced astronomers, none have glimpsed the doubtful Vulcan, although in justice it must be said that these precious moments have generally been fully occupied by the investigation of a variety of other important questions. As these, however, have gradually neared to a solution, the last total eclipse visible in America in July 1878 was devoted by several able astronomers to this task, and the search for Vulcan was perhaps the most prominent feature of the observation. Two of the observers alone claim to have seen planetary bodies near the sun, though perhaps in consequence of the haste in which their respective positions were noted it has not been found possible to identify and reconcile the remarks of the two discoverers, so that whether there were one or two or three or four Vulcans seen during the eclipse is regarded by some as an open question. One point, however, is conceded, viz., that none of the four can possibly be the theoretical Vulcan of Leverrier, nor

the inferred planet of Oppolzer, and we are thus afforded valuable evidence that the cause of the erratic movements of Mercury has not been discovered, and in all probability is not discoverable in the shape of a planet nearer to the sun than it.

It would be useless, however, to deny that much interest attaches to what was actually seen in America last year, and it is with a certain amount of relief that we find the examination of the observations then made has been taken in hand by so eminently able a mathematician as Dr. C. H. F. Peters, and a result evolved that admits of no cavil. He has shown to the satisfaction doubtless of all unprejudiced persons that the discoverers were themselves mistaken, and had fallen into the error of taking conspicuous stars to be minute planetary bodies, and without impugning either their ability or their honesty, the excitement and hurry of the moment are amply sufficient to account for the erroneous announcement which startled the world a few months since. At the very moment when the believers in Vulcan thought they had their hands on the object of their search have their hopes been dashed to the ground; and as if to crush the last lingering remains of life entirely out of this hopeful hypothesis the same astronomer has been able to show incontrovertibly that the most trusted observation of the supposed planet on the solar disk is utterly unreliable. It is seldom that so fatal a stroke has been aimed at a long-cherished scientific fallacy.

But it must not be forgotten that the change of position of the axis of Mercury's orbit is an ascertained fact and needs explanation. We require continually to improve by observation the data upon which our theoretical results are based, and should it be found, as there is already some ground for believing it may be, that the planet Venus is a denser and more powerfully attracting body than it has hitherto had the credit of being, the difficulty will be solved, and the theory of gravitation will stand in as proud a position as it could have done had the conjectures of Leverrier been confirmed by the discovery he so ardently longed for.

ON THE STUDY OF INFLORESCENCE.

By H. W. SYERS, B.A. Cantab.

THE consideration of the manner in which flowers are arranged on the axis which bears them is a very interesting and a very important division of botanical study. Not only do we find that flowers, in their position and arrangements, are far from occupying merely haphazard and chance positions, but, on the contrary, in all cases the arrangement follows such simple and definite forms, that systematic botanists have found the inflorescence or antitaxis a most valuable assistance and guide in classification. The study of inflorescence teaches us not only the relative positions of the flowers to each other and to

the axis, but also the order in which they open, and this is called their evolution. We must remember that in all cases a flower-bud is like a leaf-bud; and that the flowers, like the leaves, arise from the axis in one of two ways: that is to say, the buds are either produced in the angle formed by the inclination of a leaf to the stem (axillary), or else they arise from the termination of the axis (terminal). But in the axillary mode of inflorescence the leaf which forms the angle with the axis is called a *bract*. In many cases these bracts are not to be distinguished from leaves, and their structure is similar. Such instances occur in the

from below upwards—those situated lowest expanding first, the axis itself being carried on indefinitely. Thus the expansion of the flower is centripetal—centre-seeking. The simplest form of the inflorescence is seen in the currant, fumitory, &c. In this the pedicels (secondary axes) are of equal length, and each has a bractlet at its base. The corymb is simply a slight modification of the raceme—the lower pedicels being longer than the upper ones, and thus forming a more or less flattened surface. It should be noticed that an inflorescence which at first appears to be corymbose, may ultimately become racemose—e.g. in Cruciferae.



Fig. 119.—Forget-me-not (*Myosotis palustris*), showing scorpioid inflorescence.



Fig. 120.—Comfrey (*Symphytum officinale*), showing scorpioid inflorescence.

periwinkle (*Vinca*), pimpernel (*Anagallis*) &c. But in other cases these bracts assume a very different appearance, so that even the most superficial observer would notice the want of resemblance to true leaves. Spathes, glumes, the involucre of Compositae and scales are all so many modifications of bracts, and it should be borne in mind that all these are but different forms and arrangements of leaves—the leaf being the morphological type on which the whole structure of the flower is founded. It is noticeable, in passing, that the presence or absence of bracts constitutes a valuable classificatory medium. Now, as has been mentioned above, flowers are either axillary or terminal in their relation to the axis. And it is this relation which gives origin to the two great divisions of inflorescence: indefinite and definite. In the former division the axis gives off axillary buds, which expands

The umbel is another form of this inflorescence, the primary axis being shortened, and the secondary axes coming off from the same points (radii), so as to be nearly equal in length.

Notice also the bracts forming the involucre and involucl in Umbelliferae. There is a term to which different meanings have been attached by different writers—the panicle. Perhaps the best definition of a panicle would be an inflorescence in which the secondary axes give rise to tertiary ones which bear the flowers. But it is frequently used to express a totally different kind of inflorescence (the definite), and, like all terms which are ambiguous, has become unsuited to the requirements of true science. The spike is simply a sessile raceme, and the spadix a succulent spike.

We now pass on to the second great division of inflorescences, the determinate or definite. Here the primary axis ends in a solitary bud; and if but a single floral axis is formed the inflorescence is of the simplest possible description. Should there be more than one axis, the others arise from the first in an axillary manner, but lower down and farther away from the central axis. The flowers expand in a centrifugal manner (centre-flying) and later, as

secondary axes are three in number, and the arrangement is three-divided. It should be noticed that the cymose inflorescence is frequently associated with opposite leaves, though this is not always the case. A very interesting and most curious modification of the cyme is seen in the scorpioidal cyme. This is simply a dichotomous cyme, in which the buds on one side are not developed, thus becoming unilateral. A study of this mode of inflorescence, as seen in the Bora-



Fig. 121.—White Dead-nettle (*Lamium album*), with cymose inflorescence.

regards time, than the flower terminating the primary axis. The best example of a definite inflorescence is the cyme, and can be well studied in the order Caryophyllaceæ. This cymose inflorescence may be either dichotomous or trichotomous. In the former, the primary axis gives rise by axillary buds to two secondary axes, and each of these again to two others. Thus there is a sort of division by pairs; hence the term ($\delta\acute{\iota}\chi\alpha$, by twos). In the latter the



Fig. 122.—Centaury (*Erythraea Centaurea*), showing trichotomous cymes.

ginaceæ (*Myosotis*, &c. (figs. 119 and 120), will be found most interesting and instructive. Should any one feel doubtful as to his correct appreciation of the term cyme, let him at once examine this form of the inflorescence, and his power of interpreting the mode in which the flowers come off will afford a sure test of his accuracy in this respect. The last form of definite inflorescence that we shall notice is the verticillaster. Here a pardonable mistake is easily made by the tyro in botany.

For to all appearance the flowers are simply arranged in a circle or *whorl* around the axis. But more prolonged observation shows that this is not the case. In point of fact the inflorescence is cymose—though withal the cymes are nearly sessile—and, of course, the expansion of the flowers is centrifugal. For this mode of inflorescence the common Dead-nettle (*Lamium album*, fig. 121) and other Labiatae may be studied. And now we must just touch on the subject of mixed inflorescence. In some cases the

two kinds of inflorescence, definite and indefinite, may be observed on the same plant. For the inflorescence, taken as a whole, may be definite, and the individual inflorescences may be indefinite, and *vice versa*. An example of this occurs in the genus *Senecio*, and in other genera of *Compositæ*. If a head of groundsel be examined it will be noticed that the aggregation of florets forming the capitula or heads, taken together, have a centripetal expansion, the general inflorescence being indefinite. But if the expansion of the individual heads be observed, it will at once become clear that the inflorescence is centrifugal, and therefore definite. Here, then, in the same plant are found two distinct forms of inflorescence, hence the inflorescence is said to be mixed. Another instance may be cited, that of the verticillaster of *Labiata*. As explained above, the partial inflorescence is definite and centrifugal; but the general inflorescence is centripetal. There are many other examples of these mixed inflorescences, all of which are well worthy of careful study. The names of a few genera with mixed inflorescences are subjoined: horse-chestnut (*Æsculus*), flowering-rush (*Butomus*), *Sparmannia*, *Veronica*, &c.

A review has now been taken of all the chief forms of inflorescence, and to one or other of these nearly all the inflorescences of the British orders may be referred. There are, however, some irregular forms which cannot be classified under any of these heads; but they are comparatively few and unimportant. A noticeable form is that occurring in the butcher's broom (*Ruscus aculeatus*). Here the flowers are borne on those curiously modified stems to which the name of cladodes has been applied. On taking a survey of some of the natural orders, we see in how many a certain marked form of inflorescence obtains. For example: the prevailing form in *Crucifera* is the raceme or corymb; in that interesting order *Caryophyllaceæ*, or *Clovewort* order, the cyme is the typical mode of inflorescence, and in no order can the di- and tri-chotomous cyme be studied in greater perfection. In *Linaceæ* the inflorescence is cymose, and the genus *Linum* is peculiar in having this mode of inflorescence associated with alternate leaves, not opposite, as is usually the case. It is hardly necessary to refer to the inflorescence of the *Umbellifera*, for it is so characteristic that it is impossible to mistake it. In *Rubiaceæ* (the *Madder* family) the flowers are often arranged in sessile or peduncled cymes. The inflorescence of *Compositæ* has been already explained—as affording an instance of a union of the two great types. The cyme is again seen in great perfection in *Gentianæ*—the *Gentian* order—and the beautiful little flowers and delicate trichotomous cymes of the *Centaur* (*Erythraea Centaurea*, fig. 122) must be familiar to all. It is not necessary to describe the inflorescence of the *Labiata*, as it has already been referred to. Other orders worthy of notice are *Primulaceæ*, *Lentibulariaceæ* (containing the curious genus *Utri-*

cularia, supposed to be carnivorous) *Plantaginaceæ*, *Urticaceæ*, etc. A study of inflorescence in these and kindred orders, is of the highest interest and importance, giving not only enlarged and comprehensive views of the different flower-arrangements obtaining in the different groups, but also training the mind to exact and precise methods of observation and comparison. And the writer has endeavoured, by drawing attention to this subject, to point out to all lovers of nature in general and of flowers in particular, how far preferable it is to start from the very first in a truly scientific and accurate spirit of enquiry. For in this single instance of flower-arrangement, an immense amount of mischief has been wrought to true botany by the ambiguous, loose, and inaccurate use of such terms as raceme, thyrsus, panicle, &c., so that since the time of MM. Röper and Bravais (to whom the first accurate observations of flower-arrangement are due) an immense vocabulary, totally meaningless and useless, has arisen on the subject of inflorescence. The writer hopes that some readers of *SCIENCE-GOSSIP* at all events will turn their attention to this most interesting subject, the study of which, in an intelligent and comprehensive manner must be attended with the best results.

THE NEW FOREST.

By E. D. MARQUAND.

[Continued from p. 125.]

AND now as to the flora of the New Forest. In richness and variety it yields to no other spot of equal area in the kingdom, though it is possible that a few specially-favoured localities may slightly exceed it in the number of species. Within the limits defined at the outset of this paper, I have found and catalogued very close upon seven hundred and fifty phanerogams; besides these there are several which I know on excellent authority to exist, but have not as yet come upon them—and not to speak of those given in books as occurring, but which have not been traced, we have a total which does not fall far short of eight hundred; that is, one half of the entire British flora as enumerated in the "London Catalogue." This is a goodly number for a district something under fifteen miles square.

Some of the rarer and most interesting species which have come under my observation deserve a passing note, and it will facilitate reference and at the same time be more methodical, to follow the order adopted in the "London Catalogue."

Number 1 first calls for notice: *Clematis Vitalba*, a plant common enough on the chalk, but one would scarcely expect to find it here, yet it flourishes in the hedges of a lane on the coast, a few miles from Lymington. Among the *Crucifera* only two need be mentioned: *Diplotaxis muralis* and *Draba verna*; the latter (usually so abundant) being exceedingly

rare in these parts; I searched for it in vain during three seasons, and at last found it on a wall in the vicinity of Ringwood. *Viola lactea* occurs on many heaths, and I fancy I once found *V. stagnina*, but am not certain. Another generally common plant is here of great rarity: *Malachium aquaticum*. *Claytonia perfoliata* grows in profusion in the sand at Mudeford and its neighbourhood, where in the salt marshes may be seen *Althea officinalis*, and occasionally in the hedges (but always introduced, of course) *Lavatera*. The Leguminiferae include some rare species: no one walking across any of the forest heaths and moorlands in the month of August can fail to notice the trailing golden-blossomed *Ulex nanus*, which in some places attains a height of three feet or more. On the coast we get that very small plant with a very long name, *Trigonella ornithopodioides*, and *Medicago maculata*. *Trifolium glomeratum* I discovered here last summer, and *Vicia orobus*, a northern plant, was pointed out to me; as far as I know it only occurs in one spot, not easily discoverable, but when once seen its delicate pale green fern-like leaves are not to be mistaken. Though it is miles from any habitation I cannot, for various reasons, consider it truly indigenous. *Agri- monia odorata* I discovered two years ago; it is a much larger plant than its congener, and may always be recognised by its lemon-like fragrance. I almost believe now that *Isnardia palustris* is extinct, in this part of the county at least. *Tilia muscosa* is frequent on sandy heaths.

The Umbelliferae do not furnish anything very good, as far as my experience goes, except, perhaps, *Enanthe pimpinelloides*, a rather common plant in this neighbourhood, *Faniculum*, about Christchurch, and *Crithmum maritimum* on the sea wall. *Rubia peregrina* seems only to occur under the shade of the clematis before alluded to, so both may possibly have been introduced from the Isle of Wight. *Tanacetum vulgare* is rare; *Inula crithmoides* grows here and there all along the sea wall, and *Crepis biennis* I have found on the coast. The delicate little *Wahlenbergia hederacea* grows profusely in some boggy ground not far from Lyndhurst; almost all over the Forest the tiny golden stars of *Cicendia filiformis* peep among the turf; and the splendid large blue corollas of *Gentiana Pneumonanthe* gleam among the heather on a few moist heaths. *Linaria repens* is common in hedges at Marchwood, and near Brockenhurst, and, in a few other places, *Bartsia viscosa*. *Orobanch minor* also grows near here, though sparingly, while *O. major* seems peculiar to Beaulieu.

As every one knows, *Pulmonaria angustifolia* is one of the great botanical features, and is so widely and plentifully distributed throughout the forest that there is not much fear of its eradication. The lovely little *Pinguicula lusitanica* is common enough in the bogs, where may be seen the delicate threadlike branches of *Utricularia minor*, but *U. intermedia*, though abundant where it exists, is rare. In a few

bog pools I have met with *Sparganium minimum*, and in one locality only the singular *Actinocarpus damasonium*. Of orchids we have a good number: *Orchis incarnata* I have seen growing with *O. latifolia* and *O. maculata* in the bogs at Holmsley. Since writing my note in SCIENCE-GOSSIP, vol. xiv. p. 138 on *Spiranthes aestivalis*, I have been so fortunate as to discover it in another part of the forest, well established and in great plenty. It is quite unnecessary here to specify the locality. The tiny *Malaxis paludosa* I find pretty widely distributed, though doubtless it frequently escapes observation. The habitat of *Gladiolus illyricus* is in the heart of the Forest, apparently flowering only once in two years—at any rate in some seasons not a single flower is to be seen. *Luzula Forsteri*, a handsome woodrush, grows both near Brockenhurst, and very abundantly in a wood near Beaulieu.

The Cyperaceae include some very interesting plants: *Rhynchospora fusca* grows in almost all wet bogs, *Scirpus uniglumis* on many heaths, and *Sc. Savii* commonly in roadside ditches. The Carices are well represented: I have found thirty-three species, and know of three or four more. Among the best I have seen are *Carex limosa*, *C. Oederi*, and *C. montana*. The last flowers very early and was almost past when I discovered it last year. It is a rare sedge, and a good addition to the county flora.

Lastly, the grasses. Among the best I know are: *Leersia oryzoides*, in two or three parts, always on river-banks; *Phalaris canariensis*, apparently wild on the sandy shore at Mudeford; *Gastridium lendigerum*, frequent, mostly near the coast; *Agrostis setacea*, on heaths near Brockenhurst; *Calamagrostis lanceolata*, at Holmsley and Ringwood; *Aira setacea* (*A. uliginosa* "Lon. Cat.") in several of the bogs near Brockenhurst; *Sclerochloa procumbens* near the sea; *Brisa minor*, occasional, and nearly always in cultivated fields; *Bromus madritensis*, not far from the shore, and *Triticum acutum* at Mudeford.

Twenty species of ferns are said to occur, but I cannot say whether quite as many are to be had within the district about which I am writing; I know of sixteen only. The stately *Osmunda regalis* is well distributed; I have seen it in half-a-dozen places within a couple of miles of Brockenhurst, sometimes forming large clumps, with fronds three or four feet long, sometimes helping to make the hedge of a field. *Lastrea oreopteris* is frequent in old woods, and so is *L. spinulosa*. In most hedgebanks in the south grows *Scopolopodium vulgare* frequently side by side with *Asplenium trichomanes*, which here luxuriates in dry shady banks rather than old walls, for one simple reason—old walls are exceedingly scarce. *Asp. ruta-muraria* grows sparingly on the ruins of Beaulieu Abbey, and *Ophioglossum vulgatum* on Ashley Common. *Lastrea thelypteris* grows somewhere in the vicinity of Lyndhurst; the exact spot I

have not hitherto been able to discover. The Fir Club-moss (*Lycopodium selago*) occurs on Setley Heath and near the old Beaulieu Road station.

Of mosses I have collected many fine and interesting species. *Anomodon viticulosus* is frequent on trees, and so is *Neckera pumila*, which fruits at Knyghtwood. *Campylopus brevifolius* is common on the borders of some woods; near the sea we have *Orthotrichum phyllanthum*, and at Sway *Leptodon Smithii*. About fifty species of *Hypnum* have come under my notice, and probably several others occur. Among these are *H. caspitosum*, *H. glaucosum*, *H. megapolitanum*, *H. ilicetbrum*, and *H. chrysophyllum*. In some of the woods near Brockenhurst *H. triquetrum* fruits abundantly, and *H. scorpioides* grows to a very large size; I have seen it nearly a foot in length. *Splachnum ampullaceum* occurs in the bogs, and the *Sphagnum*s include some very curious forms, which it will probably be less difficult to identify when Dr. Braithwaite's new work is published.

The New Forest may perhaps be regarded as the metropolis of coricolous lichens, while the saxicolous sections are either very poorly represented or altogether absent. The Graphidei are very abundant, and in this tribe I have collected such species as *Graphis dendritica*, *Opegrapha lentiginosa*, *O. viridis*, and *Arthonia punctiformis*, some of which are common, and I have found many of the rarer *Calicia* generally distributed. At Knyghtwood, not far from the famous Knyghtwood Oak, the largest oak in the Forest, may be seen within a few yards of each other three interesting cryptogams: *Pannaria rubiginosa*, *Stictina limbata*, and *Hypnum loreum*, and at no great distance *Ricasolia heterovirens* fruits abundantly. On Roydon Common, near Brockenhurst, grows the curious *Pycnothelia papillaria* with inflated podetia, and in the Hinchelsea woods the delicate little *Normandina pulchella*, which has something of the appearance of a pale blue scale-moss. The species of *Lecidea*, *Lecanora* and *Verrucaria* are "too numerous to mention."

And now in conclusion I have just two words to say as to the Diatomaceæ, of which I have collected a considerable number of species in this neighbourhood. I find my notes have already stretched to such a length that I cannot even mention the names of many interesting forms; three species, however, on account of their rarity, deserve brief mention. The first is the pentagonal variety of *Amphitetras antediluviana*; the discovery of which I recorded in SCIENCE-GOSSIP in January, 1877. It is rare, and always accompanies the more common form, the var. β . All those who have seen it will, I am sure, agree that it is one of the most striking and beautiful of British diatoms. The next is *Surirella elegans*, figured in SCIENCE-GOSSIP, vol. iv. p. 132, a diatom identical with the *Sur. sclesviensis* of American deposits, but which as a British species appears to be very little known among diatomists. It has occurred in almost all my bog

gatherings, sometimes in abundance and of very large size; indeed I look upon it as about the commonest of our *Surirella*, excepting perhaps *S. biseriata*. Lastly, another of the same genus described and figured as a new British diatom in SCIENCE-GOSSIP, vol. v. p. 61, under the name of *Surirella Capronii*, a species differing from all others of the genus by the possession of two hornlike processes springing from the median line. I found it in small numbers in a salt-marsh gathering, and my specimens are very much larger and finer than the ordinary forms of *S. splendida*. The only British locality for it then given was Shere, in Surrey.

This brings my remarks on the fauna and flora of the New Forest to a close. Very imperfect they cannot fail to be, since only a few species have been selected to illustrate each section; and even my own lists, compiled from personal observation and comprising some thousands of names, are in almost every department still far from approaching completeness. But there are many naturalists devoted to special branches who might add largely to our knowledge of the rich natural resources of one of the most delightful, interesting, and exhaustless districts in the United Kingdom.

NET LIGHTNING.

By the Rev. S. BARBER, F.M.S.

HOW glorious and awe-inspiring a spectacle is presented to the student of nature's mysteries, when, flashed in an instant through the impenetrable gloom of night there stands out before his unsuspecting sight a varied and sublime expanse of cloud scenery, distinctly revealed; towering crags, dark abysses, and every lineament of its gorgeous structure, traced sharply out by the dazzling and unearthly splendour of the lightning.

By daylight, in such a condition of the atmosphere, when the electrical tension of the individual cloud masses towards each other and between these and the earth is unusually strong, we cannot fail to observe the sharpness of definition, apparent solidity and great volume which the cumuli exhibit. There is, however, no more remarkable characteristic observable at these times of electrical disturbance than the individuality of structure, if I may so express it, which they present to view; an individuality of form which appears to be intimately related to the electrical tension of each mass of vapour. This may be well seen when two highly condensed and vertically posed peaks rise aloft, and drawing into close proximity to one another, leave a long narrow interstice with jagged edges between them. (See fig. 123.)

Such an appearance is probably never seen in settled weather, being, in fact, one of the most striking indications of electrical excitement. The forms illustrated in the sketch are perhaps rather evidences of repulsion than attraction between the masses.

Sir W. Snow Harris, in his treatise on electricity,* suggests the following as a brief explanation of the discharge between the clouds and the earth: "If," says this writer, "we consider attentively the electrical conditions of a thunderstorm, we may observe in them all the elements of the Leyden experiment: the atmosphere in fact becomes a great coated pane,

regard to the air which forms their base. Thus one large, leading cumulus may become a centre of force ready to operate, not only on the earth beneath, but on various collateral masses of the surrounding vapour, when the general equilibrium is disturbed.

The tension, then, becoming too great, and the balance of forces being disturbed, the discharge



Fig. 123.—Approach of Electrical Cloud-masses.

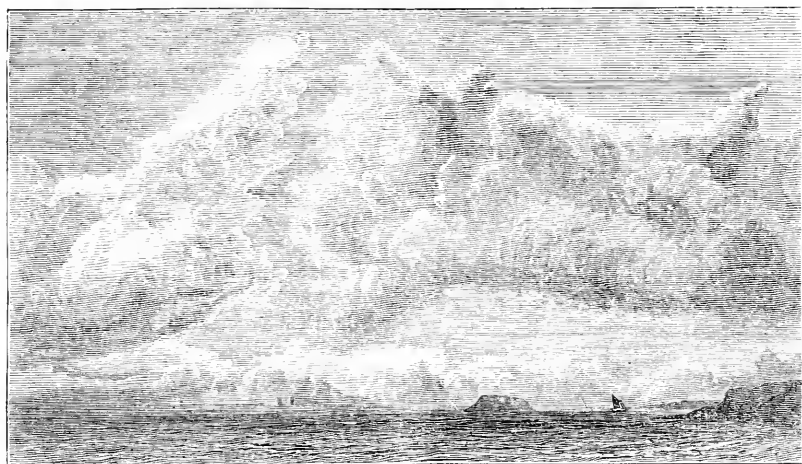


Fig. 124.—Approach of Electrical Cloud-masses, seen in perspective.

or fulminating square, of which the charged cloud is the insulated and the surface of the earth the uninsulated, terminating conducting planes; the phenomena of thunder and lightning are neither more nor less than disruptive discharges through the intervening air."

In explaining the thunderstorm by reference to the principles of electrical induction, and of the disruptive discharge, the reader will observe that much depends upon the condition of the air contiguous to the earth and subjacent to the cloud—in regard to conductive power.

And it may well happen that large masses of cloud, separated, perhaps by intervals of several miles, may be very differently situated in this respect, with

ensuing would connect together the different points—centres of the masses—and these again with the earth. The instantaneous dissolution of a polygon of forces in this way, would, through the electric current, darting from point to point, involve an interlacing or net-work pattern in the lightning flash.

Vast, however, as is the force which the lightning wields, an apparently slight circumstance may direct its course. The configuration of the earth beneath as affecting the upward vapour currents; the presence of smoke or metallic dust might be responsible for effects most disastrous to man; so delicately balanced are the forces of nature.

Such atmospheric conditions may perhaps be

* Sixth ed. Virtue & Co.

suggested as the origin of that rare and magnificent phenomenon which we have here denominated "Net" * lightning—one of the most glorious evidences of the power and majesty of Him who creates and upholds the universe ; every atom in the dust of the balance being, as Charles Kingsley beautifully puts it, "distinctly and deliberately divine." Each particle is, indeed, if we but knew one half of the laws by which it is actuated, as much a witness to the science and the "Art of God," † as the Kosmos itself ; as distinctly the handiwork of the Great Artificer as is the majestic expanse of the starlit sky.

THE HISTORY OF THE CUCUMBER (*CUCUMIS SATIVUS*).

By H. G. GLASSPOOLE.

THE cucumber is known to have been cultivated for more than three thousand years. In ancient Egypt it was extensively grown, and is so at the present day ; the succulent nature of the plant enabling it to resist the drought of the sandy plains, while it flourishes well in the richer soils watered by the Nile. The want of this vegetable was one of the grievances complained of to Moses by the Israelites in the wilderness ; we also find it mentioned in other parts of Scripture. The cucumber is mentioned in a particular manner by some of the early Greek writers on plants. Theophrastus, writing on the cucumber, enumerates three varieties—the Bœotian, Scythic, and Laconian ; the last, he states, thrives better with watering than the others. Diocles, of Carystus, an ancient town of Greece, tells us that the cucumber eaten with sium at the first course of a meal makes the eater uncomfortable, for it gets into the head as the radish does, but that if eaten at the end of supper it causes no uncomfortable feeling and is more digestible. We are told that the farmers of those days considered that if their seed was steeped in the juice from the root of the cucumber it would be protected from the ravages of insects.

Cucumbers grown in the neighbourhood of Antioch were considered by the ancient Greeks the finest. Columella, one of the oldest Roman writers on agriculture, mentions that the inhabitants of Mendes in Egypt were accustomed to take the largest bramble-bush they could find, transplant it to a warm, sunny spot, cut it down at about the time of the vernal equinox to within a couple of fingers of the ground, then insert a seed of the cucumber into the pith of the bramble, the roots of which were well covered over with fine earth and manure to withstand the cold. By this plan they were enabled to have cucumbers all the year round. This same author states that cucumbers ought to be propagated from seed that has been

steeped in milk and honey for a couple of days, this method having the effect of rendering them sweeter and pleasanter to the taste. He also gives directions to his own countrymen for forcing this plant by artificial means. Those who wish to have them early, he says, should plant the seed in well-dunged earth, put into osier baskets, that they may be carried out of the house and planted in warm situations when the weather permits. The baskets may be put upon wheels so that they may be brought in and out with less labour, and as soon as the season advances the baskets may be sunk in the earth. Pliny states that in Italy the cucumbers are small, but in some countries are remarkably large and of a wax colour or black. Those from Africa are most prolific. He mentions that by nature the cucumber has a wonderful hatred of oil, but has a great affection for water. Of this fact, he says, we may be satisfactorily convinced in a single night, for if a vessel filled with water is placed four fingers distant from a cucumber it will have descended into it by the following morning—but if the same is done with oil it will assume the curved form of a hook by the next day. This same author tells us that the Emperor Tiberius was so fond of cucumbers, and took such pleasure and delight in them, that they were served up at his table every day all the year round. The beds and gardens wherein they grew were made upon frames so as to be removed every way with wheels, and in winter during the cold frosty days they would be drawn into certain high-covered buildings exposed to the sun, which was admitted through frames or lights covered with lapis specularis, probably talc or some transparent mineral, which the Romans knew well how to split into thin laminae, so that light might be transmitted through it. This appears to be the earliest account of forcing plants which we read of in ancient times (Phillips, "Pomarium Britannicum").

The Romans, from the remains of their villas found in this country, appear to have been acquainted with the art of heating their rooms with flues and hot water, and from this we are led to believe that cucumbers and other vegetables were extensively forced during the days of Roman splendour. Pliny mentions that a new variety of this plant had accidentally been produced in his time in Campania, the fruit of which was of the form of a quince ; it did not grow hanging, but assumed its round shape as it lay on the ground ; the seeds from this produced similar plants. The name given to this variety was *Meloepo* (Fée says that this is the melon, the *Cucumis melo* of Linnæus). Pliny appears to have considered this vegetable unwholesome in an uncooked state, as he tells us it will live in the stomach until the next day, and cannot be reduced to food, but when boiled and served up with oil, vinegar, and honey they make a delicate salad ; he also recommends a pinch of the seed beaten up with cummin and taken with wine as a good remedy for a cough.

* A reticulated pattern, instantaneously impressed upon a large expanse of sky. †

Such is the term applied to Nature by Sir Thomas Browne.

We have no precise date when the cucumber was first cultivated in England. It may have been introduced with other fruits and vegetables at the time the Romans were masters of this country. According to a note in Gough's "British Topography," vol. i. p. 134, it was, with the melon, commonly cultivated in the reign of Edward III. (1327), but in consequence of the wars between the Houses of York and Lancaster the cultivation of them, like other plants, became neglected, and at last entirely lost. It was introduced again at the later part of the reign of Henry VIII.

Our old friend Gerard mentions them thus in his *Herbal* (1596): "There be divers sorts of cucumbers, some great, others lesser, some of the garden, some wild, some of one fashion and some of another. There be also certain long cucumbers which were first made (as it is said) by art and manuring, which nature afterwards did preserve, for at first when the fruit was very little it is put into some hollow cane, or other thing made for the purpose, in which the cucumber groweth very long by reason of that narrow hollowness, which, being filled up, the cucumber increaseth in length. The seed of this kind being sown bringeth forth not such as were before, but such as art has framed which of their own growth are found long and oftentimes very crookedly turned, and therefore they have been called *Anguine*, or long cucumber." Gerard extols the cucumber "mixed with oatmeal pottage and eaten at every meal for three weeks as a perfect cure for persons afflicted with flegme and copper faces, red and shining ferie noses (as red as roses) with pimples, pumple rubuse and such-like precious faces; but at the same time they are to be sure to wash their faces with a decoction of vinegar, orris root, camphor," etc. This old author also gives the earliest direction in this country for making hot-beds for cucumbers. He directs that they should be covered with mats over hoops, as glasses were not known at that time.

Lord Francis Bacon, who wrote about 1598, says cucumbers "will prove more tender and dainty if their seeds be steeped in milk. The cause may be for that the seeds being mollified in milk, will be too weak to draw the grosser juices of the earth, but only the finer." He adds, "cucumbers will be less watery if the pit where you set them be filled half way with chaff or small sticks, and then pour earth upon them; for cucumbers, as it seemeth, do exceedingly affect moisture, and over-drinketh themselves, which this chaff or chips forbiddeth." He also states that in his day "it was the practice to cut off the stalks of cucumbers immediately after bearing, close by the earth, and then to cast a pretty quantity of earth upon the plant that remaineth, and they would bear fruit the next year, long before the ordinary time. The cause may be for that the sap goeth down sooner, and is not spent in the stalk or leaf, which remaineth after the fruit; where note, that the dying in winter of the roots of plants that are

annual, seemeth to be partly caused by the over-expense of the sap into stalks and leaves, which being prevented, they will superannuate, if they stand warm."

Parkinson, in his "*Paradisus*," 1656, tells us that in many countries they do eat cucumbers as we do apples and pears, paring and giving slices of them as we would to our friends of some dainty apple or pear. The cucumber was not generally cultivated till almost the middle of the seventeenth century, and it is stated that the first successful forcer of this plant in England was Thomas Fowler, gardener to Sir Nicholas Gould, of Stoke Newington, who presented a brace of well-grown fruit to King George I. on New Year's Day, 1721; the seeds from which they were raised were sown on the 25th of September. Some years ago the cucumber was cultivated in large quantities in the outskirts of London, and it is stated in Dr. Wynter's "*Curiosities of Civilisation*," page 229, that fourteen acres might be seen under hand-glasses in a single domain, and that it has been known that 200,000 gherkins have been cut in a morning for the pickle merchants. It is also stated that cucumbers have refused to grow well around London ever since the outbreak of the potato disease. In Loudon's time large quantities were grown in the fields of Hertfordshire without the aid of glass for the London markets during the summer months. The village of Sandy in Bedfordshire has been known to furnish 10,000 bushels of gherkins in one week for pickling purposes. The cucumber, notwithstanding its extensive use among all classes in this country, is considered unwholesome by most medical practitioners. Dr. Doran, in his "*Table Traits*," mentions that in the days of Evelyn (1699) the cucumber was looked upon as only one remove from poison, and adds that it had better be eaten and enjoyed with that opinion in memory. Abernethy also gave a quaint recipe for its use, which was to peel the cucumber, slice it, pepper it, put vinegar to it, then throw it out of the window. The extent to which the cucumber is consumed by the inhabitants of Egypt and the South-west of Asia, but also in European Russia and Germany would scarcely seem credible in this country. A correspondent of the "*Daily News*," in the summer of 1874, returning from the fair of Nijni-Novgorod, was struck with the profusion of water melons and cucumbers everywhere offered for sale. Pyramids of melon and water-melons, like cannon-balls in an arsenal, were heaped up in every direction, and as for cucumbers, you could not help fancying that a plague of them, like locusts, had descended upon the earth. You never see a Russian peasant at dinner but you see the lump of black bread and a cucumber. The cucumber seems certainly a singular dish to be so national in a country with a climate like Russia. It is the last that one would have selected *a priori* for the post; but this is only one of the great many singularities one meets with. The cucumber costs about the thirtieth part of a penny about

the Volga; perhaps this fact will explain the anomaly. (See "Gardener's Chronicle," 24th Oct. 1874). Some writer says there used to be a great annual fair at Leipzig for cucumbers, when the streets were heaped up a story high with that precious element of German cookery. In Germany barrels of half and also full-grown cucumbers are preserved from one year to the other by immersion in deep wells, where the uniform temperature and exclusion from air seem to be the preserving agents.

Nothing can be more agreeable to our olfactory nerves on a hot summer's day than the refreshing and cooling scent of a fresh-sliced cucumber, but perhaps it is not generally known that in the art of perfuming it finds its way to the toilet-table under the form of cold cream and milk of cucumbers. The large seeds of this tribe are employed instead of almonds in making cheap sugar-plums. The word cucumber is derived from the Latin *cucumis*, meaning the same thing. Some time since there was a controversy carried on in "Notes and Queries" as to the proper pronunciation of the first syllable, whether it should be *cow* or *cu*. Parkinson (1656) writes it "cowcumber," by which name it is called by the uneducated, but people with any education would never think of writing or pronouncing it otherwise than "cucumber." Tartary has been assigned to this species of cucumber as its native country, but upon what authority is equally questionable with that of the melon. No modern traveller appears to have found it wild.

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

No. VII.

By J. E. TAYLOR, F.L.S., F.G.S., &c.

IT is with a sense of delighted relief that we once more resume this series of articles; which have been



Fig. 125.—Extinct kind of Free Crinoids (*Marsupites Milleri*), from White Chalk.

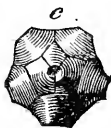


Fig. 126.—*Pentremites florealis*, one of the *Blastoidea*, from Carboniferous Limestone. *a*, Profile; *b*, summit; *c*, base or pelvis.

unavoidably interrupted by a too prolonged pressure and strain of other literary work. We propose in the present article to call attention to the commonest fossils belonging to the Star-fish and Sea-urchin family. Few fossils

have a prettier or more attractive aspect than they, and none exceed them in the singular beauty of their structures, and their marvellous adaptation to their ancient habits of life.

Now that we have got rid of the useless term "Radiata," and are beginning to arrange animals in their natural relationship to each other, we have

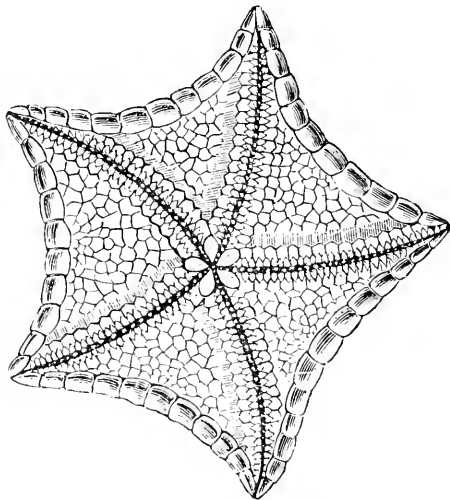


Fig. 127.—*Asterias tessellata*, one of the Cushion-stars.

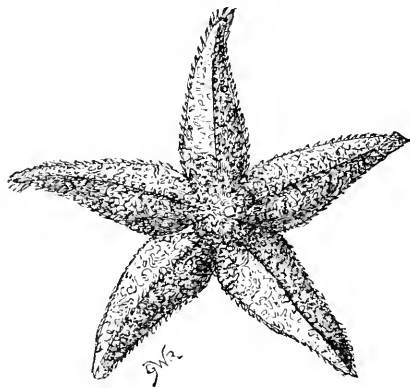


Fig. 128.—"Five-fingers" Star-fish (*Uraster rubens*).

begun to learn comparative zoology. To this most interesting study the whole science of palæontology—or that which deals with the extinct life of our globe—contributes equally with zoology. In surveying such a large natural group as that formed by the annuloid animals, we are frequently surprised by the singular way in which otherwise extreme types spring from almost common or neutral ground. Thus, the extinct groups of Cystideans and Pentremites, peculiar to the Palæozoic rocks, and which severally represent two different orders, in some measure come as near to the Encrinite family on one side as the Pouch Encrinite (*Marsupites*) of the chalk formation does both to them

and the Echini on the other. The Cushion-stars (Goniasters), run very near to the Cake-urchins or Clypeasters, although the former are star-fishes and the latter sea-urchins, and perhaps both these touch as nearly as any of their class to the Cystideans, Pentremites, and Marsupites.

Both star-fishes and sea-urchins are, geologically

been in existence throughout all the silent revolutions, physical and biological, which have so often taken place on the surface of the globe, and our modern star-fishes are as lineal and directly uninterrupted descendants of these early Cambrian fossil forms, as mankind are from their "first parents."

The upper part of the skin of such star-fishes as the



Fig. 129.—Portion of one of the arms of "Brittle Star" (*Ophiocoma rosula*), showing the claws or hooks.

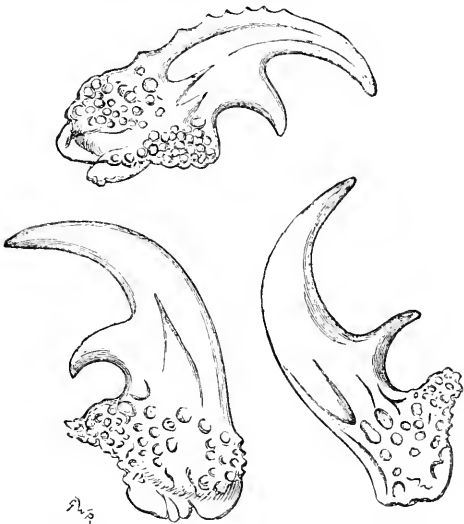


Fig. 130.—Separate hooks of "Brittle Star" (*Ophiocoma rosula*), much magnified.

speaking, exceedingly ancient. With the exception of certain Brachiopoda, we know of no other group of animals which have maintained their peculiar shapes for a longer time than the star-fishes. As far back as the Cambrian period we find two well-differentiated orders in existence, one represented by the modern "five-fingers" (*Uraster*) and the other by the brittle-stars (*Ophiura*). Evidently these two types have

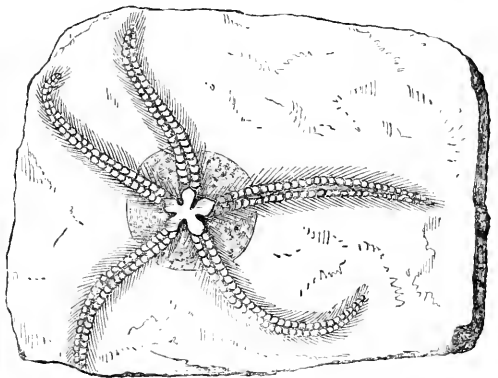


Fig. 131.—Fossil "Brittle Star"-fish (*Protaster Miltoni*). Upper Ludlow Rocks, Leintwardine.

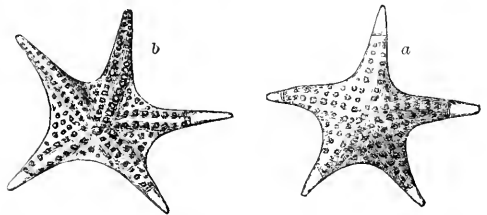


Fig. 132.—Fossil Star-fish allied to the modern "Five-fingers" (*Palasterina primava*), *a*, upper surface; *b*, lower surface, Ludlow Rocks.

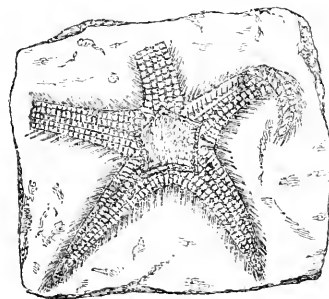


Fig. 133.—Fossil Star-fish (*Palaeocoma Marstoni*), Lower Ludlow Rocks.

"five-fingers" (*Uraster rubens*) is thickened and roughened and strengthened by the presence of grains or irregular spicules of carbonate of lime. If each of these grains had gone on increasing in size by addition to its margin, they would have grown until they touched each other, but would not have fused, and then we should have had regular plates instead of grains, and the whole body would have been covered by a kind of tessellated pavement. This is exactly

how the arms of the Brittle-stars (Ophiuridæ) and the margins of the arms and body of the Cushion-stars (Goniaster and Asterias) have been so regularly and beautifully armed, the former even more effectually than a mediæval mail-clad knight. The two groups so anciently separated, are easily recognised. Thus the "five-fingers" and "sun-stars" (Solasters) so abundant on our British coasts have the under surfaces of their arms grooved. In and out of these grooves we perceive rows of small, white, grub-like objects which slowly wriggle to and fro if we turn a star-fish on its back, and finally end by bending over and attaching their tips to the rock by means of suckers. Then by an united exertion they pull over the star-fish to its proper position. A young observer has not long to experiment on living star-fishes before he finds that these grub-like objects serve all the purposes of feet—that the star-fishes can glide along even perpendicular surfaces by their means. They are hundreds in number, but all are fashioned alike, and the mechanism which renders them locomotive organs is of the most wonderful character. These feet are termed by naturalists ambulacral, but we defer a detailed description of them until we come to speak of the Sea-urchins. The stomach of this kind of star-fish is continued up each arm, and this fact naturally groups together genera which may have a greater number of arms than five, as the "sun-stars" (Solaster) which have twelve.

In the "brittle-stars" (Ophiuridæ), on the contrary, the stomach does not extend to the arms, although the nervous branches of the ganglion surrounding the mouth do. The "sun-stars" have only two rows of suckers, whilst the "five-fingers" possess four. In the "brittle-stars" we have the central disc covered with jointed calcareous plates, and the arms defended by four rows of the same. There are no sucking feet, however, but the arms are employed as organs of locomotion, in which they are aided, as Mr. Fred. Kitton has shown, by short hooks which take hold of the surface and thus obviate the necessity of sucking-feet. Nature has usually more than one way of meeting a difficulty, and this is a case in point with the progression of the star-fishes.

Many star-fishes are characteristically deep-sea animals, and perhaps the Echinodermata, to which both star-fishes and sea-urchins belong, range to and continue over deep parts of the ocean-bed, more than any other group of marine animals. Thus, during the deep-sea dredgings of the "Challenger" we find such genera as *Ophiomusium*, *Archaster*, &c., dredged up, the latter from more than a mile and a half depth of sea water. A large star-fish, called *Leptychaster*, allied to our *Luidia*, was brought up off Cape Maclear, Kerguelen's Island, in very deep water. Another genus, *Hymenaster*, was found to be very widely distributed over the sea-floor, and at depths ranging from about half a mile to more than three miles. Star-fishes and their allies, sea-urchins, are

usually the commonest fossils of the Chalk formation, which we know was an oceanic deposit formed under very similar circumstances to the "globigerina ooze" of the mid-Atlantic. Dr. Wallich showed, when sounding in the "Bull Dog" for the first Atlantic cable, that the ocean floor was occupied by star-fishes, for these animals came up attached to the sounding-lead, and this incident first broke people's faith in the old-received notion that absence of light in the deep sea rendered it a desert for all bottom animals except the Protozoa.

The *Asteridæ* (represented by our common "five-fingers"), and the Ophiuridæ or "brittle-stars," as we have said, are found in Cambrian rocks. We have seen specimens better preserved in the fossil state than dried recent specimens usually are in museums. Sea-urchins also lived in the Palæozoic epoch, but they do not appear to have thriven well. Only two genera are known, and these are represented by but few species during periods long enough to form strata thicker than all the Secondary deposits taken together. But when we come to the Secondary period we find the Sea-urchins gaining ground. By-and-by, as in the Chalk formation, they are wonderfully common, and of multitudinous shapes and types. But by this time the Encrinurites, which we have seen were so plentiful on the floors of primæval seas, had begun to decline. Broadly, therefore, it may be stated that the Sea-urchins begin to flourish just when the Encrinurites commenced to decline.

The fossil star-fishes are not as a rule abundant, unless perhaps, we except a particular stratum in the Middle Lias, where they are so plentiful that the seam is called the "star-fish bed." At Leintwardine, where the Lower Ludlow rocks crop up and are quarried, we meet with both the kinds of fossil star-fishes of which we have been speaking. Speaking of *Protaster Miltoni* (one of the ancient "brittle stars"), Mr. Salter says it is "abundant, and of all sizes," meaning, we suppose, in various stages of growth. Few localities are better worth a geological pilgrimage than this part of Shropshire. It is only six miles from Ludlow, where the celebrated "Bone-bed" of the upper Silurian rocks may be advantageously studied. The Lower Ludlow rocks at Leintwardine are not much quarried, for they are a kind of "mud-stone," of little commercial value. Otherwise there is no doubt the number of fossil star-fishes which would be exhumed would be immense. Unfortunately, since Mr. Salter's time, the quarry where the fossil star-fishes were once so abundantly found has been either worked out, or excavation has been discontinued. Mr. Marston, of Ludlow, has a splendid series of these fossils, among them *Protaster Marstoni*. Shepherd's Quarry, near Ludlow, is another good hunting-ground. In some respects, one species, perhaps the most beautiful of the entire group, named after Professor Sedgwick (*P. Sedgwickii*), is allied to the "Feather-stars" (or rather to one division of them called Euryale

on account of the peculiar spines on the plates of its arms. This species is found only in the older rocks, such as the Caradoc beds at Bala, on the west side of the beautiful lake. At Benson's Knot, Docker Park, and other places near Kendal, in Westmoreland, where the upper Ludlow rocks crop out and quarries are opened in them, a student may expect to find *Palasterina primeva*, and *Uraster Ruthveni*, the latter named after one of the most diligent and devoted of amateur geologists that ever lived. Both the latter fossils belong to the same group as our modern "five-fingers," and they have been beautifully preserved (as any one may see, who pays a visit to the Kendal Museum), in spite of the skin being only thickened and not plated, with calcareous spicules. Two species of fossil star-fishes have been found rather plentifully in the Cambrian rocks at Welshpool, Meifod, and Corwen. Next we come to the Lias strata for abundant star-fishes, and we have seen that one bed is especially rich in them. The Liassic species usually belong to the "brittle-stars," and the commonest of these fossils is *Ophiolepis Egertoni*, found at Staithe, near Whitby; and also abundantly in various places in Dorsetshire, especially at Seaborne. Specimens of this star-fish may be seen in nearly every museum in England.

The marginal plates or ossicles of star-fishes allied to the cushion-stars (Goniaster), are not uncommon in the Chalk, and in the flints which come from that deposit. In the chalk quarries at Gravesend, Charlton, many places in Kent and Sussex, as well as Norfolk (particularly about Norwich) remains of these Echinoderms may be found, but only by practised eyes. We have seen perfect specimens imbedded in the flint nodules obtained from Ipswich and Norwich. In the London Clay of the Isle of Sheppey we find similar remains of Goniasters; ossicles, plates, &c., in a more or less perfectly preserved condition.

We should be glad to hear from any of our geological correspondents further details respecting the "star-fish bed" in the Lias—its locality, extension, species, &c.; and, indeed, concerning any fossil star-fish locality.

MICROSCOPY.

EUGLENA VIRIDIS AND ITS SUCKER-BULB.—I am glad to note further confirmatory evidence in your columns with reference to the existence of a bulb or sucker at the extremity of flagellum in *Euglena viridis*, and may further remark that Mr. George Harkus notes a central darkening or marking, indicating a tubular structure in this organ (this gentleman's sketches were enclosed to the Editor with original query, and no doubt their accuracy would be observed). Will Mr. F. Jas. George say if he has detected the bulbous termination in all examples, or only in those obtained from special localities? In some quarters the

statement of its existence has been received somewhat dubiously, but this may arise from the certain fact that only an objective of the best defining and resolving power will determine it. We (Mr. Harkus and I) found a Ross quarter inch, and a Swift's eighth to work well upon it, an immersion sixteenth had not sufficient penetration, but still revealed the bulbs coarsely. Perhaps the following observation may explain to your correspondent how the *Euglena* became metamorphosed into rotifers. Last autumn I obtained from a pond *Euglena sanguinea* in profusion. Griffiths and Henfrey regard this as the perfect form of *Euglena viridis*: the gathering was placed in a vessel covered with a sheet of glass, and in a few weeks assumed the still or protococcoid form, gradually in this interval changing in colour from red to green, the whole mass sunk to the bottom of the vessel, and during the winter continued to segment and increase by division, until now a portion has reverted to the *Euglena viridis* in its motile form, this confirms the opinion of authorities named above. I can substantiate Mr. F. Jas. George's remark, that the place of the *Euglena* "was taken by the common Funnel Rotifer." In my experiment, I find a fine and most interesting variety of rotifers, but I also invariably see the internal cavity of these individuals well stocked with what may be regarded as the zoospores, into which *Euglena* in its still condition segments, divides, and then breaks up. In fact these rotifers subsist upon *Euglena*. Could it be shown that *Euglena* was the larva of anything, the question of its animalism would of course be settled; will the existence of the bulb siphon, sucker, or whatever it is, assist in determining it?—*M. H. Robson, Newcastle-upon-Tyne.*

A NEW METHOD OF PRESERVING INFUSORIA.—Would T. C. kindly furnish more particulars of the mixing solutions? I do not understand what he means by chromic oxydichloride acid. Is it dichloride of chromium? I have some of this in solution saturated and slightly acid; but he does not state the strength or percentage either of this or of the permanganate of potash, so that I am puzzled to know how to mix it.—*T. B.*

MICROSCOPIC CLEANLINESS.—Amongst the many difficulties with which the working microscopist is surrounded, none (in a small way) is more general and annoying than the difficulty he experiences in keeping his hands perfectly clean. Let him be as particular and careful as he may, stains of balsam, pigments and varnishes, and smears of the thousand and one sticky and discolouring materials with which he has to deal *will* get upon his fingers, and to remove them he often finds to be a matter involving much time and trouble. Soap and water won't touch them, ether is expensive, and turpentine or benzole is dirty and offensive in smell. Mr. Archer, of Liverpool, has recently patented a small slab or block

of pumice stone, the surface of which is chased into quadrangular facets or dice, and which has been christened the Patent Chequered Pumice Tablet. In this little article the practical microscopist will find a true friend. All he has to do, whilst washing the hands, is to use this little scrubber with its faceted surface well covered with soap, and he will find all stains and smears vanish under its action, as if by magic. Such, at any rate, is my experience, and I have been so well pleased with it that I have thought it worth while thus to bring it under the notice of my fellow-workers, in order that they may share the satisfaction which I have experienced from its use.—*Dr. M.*

ANOTHER METHOD OF STAINING MICROSCOPICAL SPECIMENS.—*Dr. G. Brösicke*, of Berlin, recommends a combination of osmic acid and oxalic acid for staining the tissues, instead of osmic acid alone. Small pieces of the tissue, or prepared sections, are placed for an hour in one per cent. osmic acid solution, and then carefully washed to remove all superfluous acid. They are then immersed for twenty-four hours or longer in a cold saturated aqueous solution of oxalic acid (one to fifteen), and are ready for examination in water or glycerine. The result is that while certain substances, such as mucin, cellulose, starch, bacteria, the outer coat of certain fungi, &c., are scarcely at all coloured, other tissues, such as the vitreous humour, the substratum of the cornea, the walls of the capillaries, and various intercellular connective tissues, appear of a bright carmine; and muscular fibres, tendon, hyaline cartilage, the interfibrillary substance of decalcified bone, and most of the tissues rich in albumen are stained a darker carmine. The grey substance of the central nervous system, most nuclei, and many cells assume a dark Burgundy red tint. In all these cases, however, each particular tissue is stained a slightly different shade, so that it can be readily distinguished from its neighbours. None of the objects treated by this method swell up, or exhibit signs of internal coagulation. The oxalic acid produces darker or lighter shades in proportion to the length of time the specimen had previously been immersed in osmic acid, and if the latter has once completely blackened the tissue, the oxalic acid is powerless afterwards to redden it. Mixed solutions of osmic and oxalic acids stain proportionally to the relative strength of each. The chief drawback to this method is the small penetrating power of osmic acid, which prevents the whole thickness of a specimen from being equally stained.

"CENTERER" FOR SLIDES.—In your September number, 1875, you inserted a sketch of my "centerer." As I have altered and, I believe, improved it, I enclose a sketch of what I now use. The shaded part is a piece of wood about $\frac{1}{10}$ inch thick, screwed on the bed, which is about $\frac{1}{4}$ inch thick; sycamore is a good wood for it. I use a piece of paper about 2 inches

long, and can thus have two different-sized holes punched, which I place under the centre of the slip. Under this I have a similar piece with two colours on each side, so that I can use either. I find black, white, blue, and red useful. The advantages

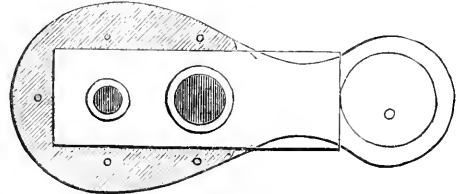


Fig. 134.—Improved Centerer for Slides.

of these alterations are that from the narrow neck and the shortness of the paper the glass is more easily handled, whilst we have more varieties on the same paper of colours or holes. I use a round button, putting the screw about $\frac{1}{8}$ inch from the centre.—*W. Locock, Clifton.*

LEAD CELLS.—*Mr. M. A. Veeder*, of Lyons, New York, recommends cells made from the thin sheets of lead with which tea boxes are usually lined. The depth of the cell may be increased, by placing several lead rings one upon another. Shallow cells may be formed with the greatest ease in this manner.

ZOOLOGY.

MISTAKES OF INSTINCT.—As a contribution to this subject, I may mention a failure of instinct in *Anthocharis Cardamines*, which has just come under my observation. I always find the eggs here laid on *Cardamine pratensis*, and always on the pedicel of the flower. When the flower-bud is very small, it is almost sessile; but still the egg will be found so placed as to avoid the floral envelopes, which being very caducous will have fallen before the egg is hatched, while it is the growing seed-pod which the young larva wants to get at. I had some *A. Cardamines* this year which were bred and laid eggs in a gauze cage upon cut flowers of Cardamine, and in one instance the egg was deposited upon the sepal of the flower, where in the natural course of things it must have perished.—*J. A. Osborne, M.D., Milford, Letterkenny.*

SIMULATION OF DEATH BY INSECTS.—In an interesting paper read not long ago before the Entomological Society, the simulation of death so frequently observed among insects was regarded not as an intentional stratagem to escape danger, but as a species of catalepsy due to terror, and was, if I mistake not, compared to the so-called fascination which certain birds and small mammals experience in presence of a serpent. It seems to me that the tendency to such simulation in different species is, roughly speaking,

inversely as their locomotive powers. Thus as far as the true insects are concerned, shamming death is most common among the Coleoptera, the order whose locomotive faculties are upon the whole lowest. Looking again at the different groups of Coleoptera, we find the tendency to simulate death absent, or at least very rare, among the tiger-beetles, carabs, and the Geodephaga generally; among the long-horns, which, when alarmed, rise in the air almost as readily as do bees or Diptera; among the Staphylini, which both fly, run, and fight well, and among the Elateridæ, which escape danger by a sudden leap. On the other hand, the semblance of death is often put on by the Lamellicornes, which are slow crawlers, blundering fliers, and are incapable of taking wing without some time for preparation. All these properties are still more decided in the genus *Byrrhus*, and here accordingly we find simulation at its height. At the mere sound or vibration caused by an approaching footstep, human or brute, a *Byrrhus* draws in its legs and assumes very effectively the appearance of a small stone or rounded clod of earth. Has a *Byrrhus* ever been taken on the wing, or recognised when flying? Among spiders the same distinction may be traced. The slower and more sedentary forms, if in presence of a powerful enemy, roll themselves up in a ball, and may easily pass unobserved. On the contrary, the wandering ground spiders, such as the *Lycosæ*, which in warm weather bound with such rapidity that they are sometimes by careless observers supposed to fly, rarely resort to this stratagem except when very persistently teased and intercepted.—*C. R. Slater*.

PEARLS IN PECTEN MAXIMUS.—Lately my friend, the Rev. H. F. Edge, was indulging in a dish of scallops, when he found something which he considered extraneous and improper in his food, but which on examination proved to be two perfectly spherical pearls, one considerably larger than the other, in fact as large as a small green pea, the other smaller, in colour milky white, similar to what I have from *Ostrea edulis*. Never remembering to have met with a similar case in *Pecten maximus*, nor of the circumstance being mentioned in Jeffrey's "British Conchology," I thought it would be of interest to SCIENCE-GOSSIP.—*John E. Daniel*, 6 The Terrace, Epsom.

HELIX LAPICIDA, var. MINOR.—My young friends, the Misses, are again to the fore; they were anxious to find *Helix lapicida*; they were successful, and more than so, for they brought me a number of the variety *H. l. minor*. Personally I do not remember having ever seen it before. The type, as most of your readers are aware, is, although not rare, very local. The locality is a wall in Downside, Epsom. I have no doubt they would gladly supply other collectors in exchange for other British land and fresh-water shells.—*John E. Daniel*, 6 The Terrace, Epsom.

CAPROS APER, OR BOAR-FISH.—In last month's number of SCIENCE-GOSSIP you have a record of specimens of *Capros aper* having been taken at Exmouth and Swanage, and I can now add to these Eastbourne, as two of my children found a fine specimen about 5½ inches in length, on the beach close to the town, which was alive when caught, and retained its brilliancy of colour until put in spirits on the following Monday. I believe it is the first time it has occurred here.—*F. C. S. Roper, F.L.S. &c., Eastbourne*.

BOAR-FISHES AT THE BRIGHTON AQUARIUM.—Perhaps the following brief notes on the boar-fish (*Capros aper*) may interest some of the readers of SCIENCE-GOSSIP, as the subject has recently attracted attention in your columns. Its occurrence in the British Channel seems to be hardly so rare an event as supposed by your correspondent in the May number. In vol. ii. of Dr. Günther's "Catalogue of the Acanthopterygian Fishes in the British Museum," the Mediterranean is given as the usual habitat of the boar-fish, which is further stated to occur occasionally off Weymouth, Plymouth, and Brighton, and more rarely on the Irish coast. Its appearance on the Sussex coast is noted in Mrs. Merrifield's "Natural History of Brighton," and I believe Dr. A. Günther, F.R.S., caught the first specimen obtained off that town. There are at present two healthy boar-fishes in the Brighton Aquarium, captured about a month ago. In the summer months, the tank generally occupied by several beautiful specimens of varieties of the wrasse is rendered additionally attractive by the presence of this pretty little bright-coloured genus, which is by no means a bad show fish, despite an occasional preference for rocky corners. Its habits seem to resemble those of the dorys (Zeus), for, like them, it often remains nearly motionless in the water about halfway from the surface, and swims in the same stately manner. The boar-fishes once acclimatised are tolerably hardy in captivity, thriving well on a shrimp diet, but, as might be expected, they are very sensible to cold. They seem to have been more than usually plentiful this season, for Mr. Lawler, the curator of the Aquarium, informs me that twenty were caught together a short time back. The occurrence of the "poisson sanglier," according to M. Eugène Deslongchamps, is a much rarer event on the Normandy coast.—*Agnes Crane, Brighton*.

"A WONDERFUL DISCOVERY."—Under this title, the "Brisbane Courier" published a long and matter-of-fact-looking account of suspended animation, which has been republished in the English newspapers, and given rise to no small amount of comment. The "Courier" now acknowledges it has been the victim of a hoax, and all those people who have been contending for the possibility of suspended animation for months and years at will have been "sold."

PLATES OF BIRDS' EGGS.—An excellent coloured plate (27 inches by 16 inches, on sheet 29 by 21 inches) of European birds' eggs is published by Bouasse-Lebel, 29 Rue St. Sulpice, Paris, at two and a half francs. It contains 184 figures, natural sizes. Any French bookseller would supply it in London for about half-a-crown. The plate in question is No. 141 of the "Tableaux Synoptiques." The series comprises nearly 200 plates illustrative of almost every branch of scientific, mechanical, historical, social and domestic inquiry—which, so far as I know, are not equalled for quality and price.—*R. T. Lewis.*

BIRDS SINGING AT NIGHT.—On Monday, May 13, I heard several birds singing in the park here as late as half-past ten, the night being quite dark. On Tuesday, May 14, I also heard one or two about the same time. As there were (on the first night) several singing, I was unable to distinguish any but the thrush.—*F. W. J., Reigate.*

BIRDS SINGING AT NIGHT.—Having seen several notices of birds singing at night in *SCIENCE-GOSSIP*, I thought this might be worth mentioning. While staying at Maidstone last month (May), I heard a cuckoo distinctly at about 10.30 or 11 P.M.; the night was fine, and the nightingales were singing loudly.—*J. M. Ward.*

BIRDS OF INDIA.—At a recent meeting of the Zoological Society, the secretary exhibited and made remarks upon two volumes of original drawings of the birds in India, which had been deposited in the Society's library by Brigadier-General A. C. McMaster. The volumes contained about 270 figures of the birds of India, most of which had been drawn by soldiers in General McMaster's house at Secunderabad.

"NATURE CARED FOR, AND NATURE UNCARED FOR," is the title of a shilling pamphlet published by West, Newman, & Co., London. It is in reality a lecture by Mr. H. B. Hewetson, M.R.C.S., on "Ornithology," and is a thoughtful and reverent and well-expressed series of utterances on the mode in which natural phenomena impress the hearts of men. We have much enjoyed its perusal, although we do not always commit ourselves to the opinions of the author.

THE GREAT ATLAS MOTH.—We have received a copy of a monograph by P. H. Gosse, F.R.S., on the "Life-History of the Great Atlas Moth of Asia" (*Attacus Atlas*, Linn.), the largest known species of Lepidoptera, containing a beautifully finished coloured plate of its transformation. The work is published by West, Newman, & Co., London. The monograph is a careful study of the moth from specimens reared by Mr. Gosse from the egg to the adult stage.

THE TEACHING OF NATURAL HISTORY.—In a recent address Mr. Gladstone spoke as follows in

favour of natural history teaching in schools:—I cannot help saying one word upon that subject which I think, on the whole, has been worse used in the schools of this country than all the other branches of knowledge. I mean that which is called Natural History. I speak of natural history, such as is open to you both by the study and by the observation of living objects and of dead objects in nature, such as continually come around and solicit your attention. I do not myself believe that natural history has had quite fair play, and I have always felt it most grievous among the many blanks of our early training that we were totally ignorant of it. I will just give you these four points in connection with natural history. In the first place, it is a continual lesson—a lesson at once easy and profound—of the wisdom and beneficence of Providence, a continual confirmation and belief, when you find the wonderful hand of that Workman descending to the smallest objects with the same care with which He mounts to the greatest. The religious use of natural history is one that all must delight in. The next point is this. Learning is an admirable thing, but it does not always make itself agreeable at the first introduction, at least that was my experience; I don't know whether it is yours. Much has been done, I believe, to improve these initial stages. It certainly is a marked advantage in the study of natural history that it leads you on by the hand; it inveigles you, if I may say so, into learning what is good and what is useful. Many a one might have his mind first opened to the attractions of natural history, which mind, if once opened, might perhaps be capable of applying itself beneficially to harder and more repulsive studies. Another point is this, natural history is one of the best and most efficient means for the education of the senses. Some may perhaps tell us that our senses are educated well enough already, and claim quite large enough a portion of our existence. Of course that is perfectly true so far as the grosser forms of enjoyment are concerned; but so far as the senses are concerned as organs for the acquisition of knowledge, they are very indifferently educated indeed. This habit of minute, careful, and accurate observation, which is inseparable from natural history studies, gives to the senses that habit of accurate distinction which is invaluable as an assistant in the pursuit of every branch of knowledge. Lastly, let me say that these analogies of natural history are invaluable; they have a most gracious effect in developing the finer faculties of the mind; they establish a connection between the different portions of creation.

HOW TO ESTABLISH A ROOKERY.—We wish to establish a rookery in the churchyard garden of St. John's, Waterloo Road, Lambeth. Will any of your readers kindly assist us by telling us the best plan to pursue?—*Arthur J. Robinson.*

GEOLOGY.

THE PRE-CAMBRIAN ROCKS OF CAERNARVON.—A paper on this subject has just been read by Professor T. McKenny Hughes, in which the author divides these rocks into (1) the volcanic series, (2) the felsitic series, (3) the granitoid series. He traces the former of these, consisting of coarser and finer varieties, from Caernarvon to near Port Dinorwig. Beyond these comes the felsite series, which is overlapped by grits and conglomerates as far as the Bangor road, north-east of Brithdir. Above the latter comes the "volcanic series," well developed in the neighbourhood of Bangor. The author is of opinion that the Cambrian conglomerate, with associated grits, may be traced in the edge of the older massif from Twt Hill, Caernarvon, to Garth Point, Bangor, and that the beds in each of these places and near Brithdir, recently described as separate, are identical; also that the bed with purple fragments near Tairffynnon and the Bangor Poorhouse are only Cambrian conglomerate faulted down. Further, he considers that the strata of the above three series are fairly parallel throughout, and that they only form three subdivisions of one great series.

THE GEOLOGICAL SOCIETY.—The following were among papers recently read at the monthly meeting: "On a fossil *Squilla* from the London Clay of Highgate, part of the Wetherell Collection in the British Museum." By H. Woodward, LL.D., F.R.S., F.G.S. The specimen described is preserved, as usual, in a phosphatic nodule, and exhibits five well-preserved abdominal segments (XIV.—XVIII.), a portion of the carapace, traces of the thoracic appendages, and the appendages of the twentieth segment preceding the telson. The abdominal segments increase in breadth posteriorly as in modern *Squillæ*. The species is most nearly allied to a recent Australian *Squilla* (unnamed) related to *S. Desmarestii*. The author proposed the name of *Squilla Wetherelli* for the London-clay fossil.

"On *Necroscilla Wilsoni*, a supposed Stomatopod Crustacean from the Middle Coal-measures, Cossall, near Ilkeston, Derbyshire." By H. Woodward, Esq., LL.D., F.R.S., F.G.S. The specimen described was found by Mr. E. Wilson, of Nottingham, in a nodule of clay-ironstone. It consists of the four posterior abdominal somites and the telson. The author discussed its zoological characters, which led him to regard it as approaching the Stomatopoda rather than the Isopoda. He thought it probable that Dr. Dawson's *Diplostylus* is allied to this newly discovered form, for which he proposed the name of *Necroscilla Wilsoni*.

"On the Discovery of a fossil *Squilla* in the Cretaceous Deposits of Hâkel, in the Lebanon." By H. Woodward, LL.D., F.R.S., F.G.S. This fossil *Squilla* occurs in a collection, chiefly consisting of

fossil-fish, but also including several Crustacea and some beautifully preserved Cephalopods, obtained in the Lebanon by Professor E. R. Lewis, of Beirût. The specimens are in a compact cream-coloured limestone, most of the slabs of which contain examples of *Clupea brevissima* and *C. Botte*, fragments of *Eurypholis Boissieri*, and other fishes. Like the London-clay form, the species seems to be most nearly allied to the Australian species collected by Professor Jukes, and the segments are not ornamented with spines and ridges. The author proposed for it the name of *Squilla Lewisii*.

"On the Occurrence of a Fossil King-Crab (*Limulus*) in the Cretaceous Formation of the Lebanon." By H. Woodward, LL.D., F.R.S., F.G.S. This was another of Professor Lewis's discoveries, and was of much interest as helping to bridge over the interval between the Jurassic *Limuli* of Solenhofen and those now living. The author described the characters presented by the single specimen, for which he proposed the name of *Limulus syriacus*.

GIGANTIC REPTILES OF COLORADO.—Professor Cope describes the bones of a species of *Camarasaurus*, which he says represent a most gigantic animal. The transverse diameter of the neck vertebrae is fifty-six inches, and the diameter of the distal end of the femur is twenty-one inches. This reptile is found in the Oolitic formation of Colorado.

THE MIDLAND UNION OF NATURAL HISTORY SOCIETY, held their second meeting at Leicester, on May the 20th and 21st, and the proceedings were of a most satisfactory character. The societies in the union number about 3000 members. An address was delivered by Mr. George Stevenson; field excursions were conducted under the able leadership of Mr. W. J. Harrison, F.G.S., the energetic curator of Leicester Museum, and Mr. F. J. Mott; and conversaciones were held in the evenings. Next year the annual gathering will take place at Northampton.

REMAINS OF IGUANODON IN THE KIMMERIDGE CLAY.—Professor Prestwich has just described the occurrence of part of the skeleton of an *Iguanodon* found in the Kimmeridge clay near Oxford. The remains are evidently those of a young animal. The occurrence in this stratum proves that the *Iguanodon* was not confined to the lower Cretaceous and Wealden period as has been supposed, but that it existed during Oolitic times.

THE PHYSICAL HISTORY OF THE ENGLISH LAKE DISTRICT.—When the fittest man can be got to do required work, the result must be satisfactory. The Rev. J. Clifton-Ward, F.G.S., has just concluded a series of articles on the above subject in the "Geological Magazine," and they unquestionably form the best geological history of the Lake District which has yet been written.

THE GEOLOGY OF NORTHUMBERLAND.—Professor Lebour, F.G.S., of the College of Physical Science, Newcastle-upon-Tyne, has prepared an excellent geological map of the county of Northumberland, which is published by Andrew Reid, Newcastle. This map will be of great service to geological students.

THE ROYAL SCHOOL OF MINES.—The appointment of Professor F. W. Rudler, of the University College of Wales, to be curator of the Museum of Practical Geology, and registrar of the Royal School of Mines, Jermyn Street, in succession to the late Mr. Trenham Reeks, will give great satisfaction to all geologists throughout the United Kingdom.

UNDERGROUND GEOLOGY.—In a deep well-boring at Ware, Herts, the chalk and the gault were passed through, but the lower greensand was absent, and the boring tool at once struck upon upper Silurian rocks, lying at an angle of forty degrees, although unfortunately the direction of the dip is unknown. These rocks were found to be rich in characteristic fossils, twenty-eight species of which have been properly catalogued.

BOTANY.

ORCHIS MORIO.—In an upland meadow in South Beds, I have just obtained about a dozen spikes of this Orchis, showing every gradation of colour, from dark purple, through various shades of red and pink, to a pure white, with the exception of the characteristic green lines on the side sepals. The higher the general hue, the brighter was the green of these lines. The pollinia also varied with the colour of the flower. Those in the darkest varieties were tinged with purple, and those in the white one were a rich golden yellow. Very few insects had apparently visited these flowers, for in most of the spikes none of the pollinia had been removed, in others only two or three, and in no case were both removed from the same blossom. The visits of insects may have been prevented by the excessive rains of the last few days.—*J. Saunders, Luton.*

NUTRITION IN RELATION TO FLOWERS.—At a recent meeting of the Linnean Society, a paper by Mr. Thomas Meehan, the well-known American botanist, was read, in which the author's observations on *Wistaria sinensis*, *W. frutescens*, *Catalpa syriacifolia*, and *Limnaea perenne* were given. Mr. Meehan thinks that the struggle for power between the vegetative and the reproductive forces decides fertility, and suggests that the perfection of the polliniferous organs, and the consequent potency of pollen, is dependent on phases of nutrition involved in this struggle. Thus, in the above mentioned plants, it is seen that potency in pollen, the main element in reproductive force, operates only when there has been some check given to the force of vegetative growths.

INSECTS DESTROYED BY FLOWERS.—At a recent meeting of the Entomological Society, Mr. J. M. Slater sent a short paper on the above subject, in which he stated that, whilst it is generally admitted that the gay colours of flowers are mainly subservient to the purpose of attracting bees and other winged insects, whose visits play so important a part in the process of fertilisation, one important fact had scarcely received due attention. Certain gay-coloured or conspicuous flowers are avoided by bees, or, if visited, have an injurious and even fatal effect upon the insects. Among these are the dahlia, passion-flower, crown-imperial, and especially the oleander. That the flowers of the dahlia have a narcotic effect, was first pointed out by the Rev. L. Jenyns, who mentions that bees which visit these flowers are soon seized with a sort of torpor, and often die unless speedily removed. Mr. Jenyns also quotes a writer in the "Gardener's Chronicle," who pronounces the cultivation of the dahlia incompatible with the success of the bee-keeper. The passion-flower also stultifies bees, and bees of all kinds avoid the crown-imperial and the oleander, for the honey of the latter is fatal to flies. Mr. Slater did not remember ever seeing a butterfly or moth settling on the flowers of this shrub in Hungary and Dalmatia, and he thinks it important that observers should ascertain whether the above-mentioned phenomena be true, and, whether any insects in such cases undertake the functions generally exercised by bees, and whether flowers have a similarly noxious or deadly action upon insects.

NOTES AND QUERIES.

SLOW WORM.—Mr. E. D. Marquand in his interesting article on "The New Forest," mentions "a bright reddish-purple variety" of the slow worm. A few particulars respecting this variety as to its rarity or otherwise, whether found in any other locality, &c., would, I think, be interesting to other readers of SCIENCE-GOSSIP as well as for myself. No mention is made of it by Bell in his work on British reptiles. Has Mr. Marquand met with *Coleuber* (or *Coronella*) *levis*? I find the New Forest mentioned as one of its localities in the volume of SCIENCE-GOSSIP for 1872.—*W. G. Tuxford.*

CAT REARING A RAT.—Even a more extraordinary thing than a cat bringing up rabbits, is the following case of a cat taking care of a rat for a month, when the rat escaped. Last summer, a cat, a famous hunter, was kept in a grocer's shop in Helensburgh. She had a litter of kittens, of which three or four were drowned. A day or two after this the cat came upon a nest of young rats, six of which she killed, while she carried off two, and put them in a basket beside her remaining kittens. Her owner then put the kittens and rats in a long barrel to prevent their getting out. For a fortnight or so they all lived happily together, the rats getting no food, so they must have been suckled by the cat. One of the rats being a weakly one was overlaid. A shopman took the remaining rat out of the barrel when it ran away, but the cat found it, and took it back to the barrel. Getting annoyed by people who came to inspect the happy family, the cat

moved them all, rat included, to a corner of the shop, and a board was put up to keep them in. The rat several times tried to escape by either climbing over or making holes in the board. One night after it had been about a month under the care of its natural enemy, a piece of curtain having been left hanging over the board, the rat which had now grown pretty large escaped, and was never seen again. I pass through Helensburgh nearly every day, and saw the rat lying in the nest with the kittens.—*E. L. F.*

UNDER WHAT CIRCUMSTANCES IS THE YEW POISONOUS TO HORSES AND COWS?—In my garden there are some yew-trees, planted forty or fifty years ago, which hang over a wall into an adjoining yard, where van-horses have constantly been in the habit of standing while the vans were loaded and unloaded, and I have never known any of the horses to have suffered. There is also in a park in this neighbourhood a long row of yew-trees exposed to the deer, cows, and horses, which graze there, but I have never heard of any harm having resulted. On the other hand, I understand that in a gentleman's grounds near here, two valuable cows last year got access to, and ate some cut branches of yew, and died in consequence; and I am told that in the case of a horse which died from eating yew, a *post mortem* examination shewed that death resulted from irritation of the intestines, caused by the sharp prickly points of the leaves, rather than from any poisonous property in their juices. I shall be much obliged by any information on the subject.—*T. H. G., Kettering.*

THE NATTERJACK TOAD.—I am glad to hear from Mr. J. Campbell in your issue of January, that the malodorous charge against our little friend, the natterjack, is a calumny. I was deterred from trying to obtain a specimen on account of what I had read. Mr. M. C. Cooke gives him a bad character in his book on "British Reptiles," and the late Mr. Harland Coultas in a work entitled "The Home Naturalist" says, "When pursued, the cross (or natterjack) toad draws itself together, so that the glands of its skin empty themselves, and its body becomes covered with a whitish moisture, giving out an intolerable stench which has been aptly compared to the smell of an old tobacco pipe; this is undoubtedly a means of defence with which the animal has been provided by the Creator." No wonder then after reading this description of the reptile, I did not attempt to obtain a specimen, but addressed a query to the editor, who transferred the question to the Notes and Queries column, where a reply appeared from Mr. W. R. Tate to the effect that the reptile gave off a strong sulphurous scent when frightened. Mr. Campbell's experience of the animal is still more favourable, which would lead one to suppose that some only are able to give off this smell, whilst others do not possess the power to do so. I beg to thank Mr. Tate and Mr. Campbell for their kindness in answering my question, and as the latter gentleman has actually kept the animal, he would greatly add to his kindness if he could give me some particulars with regard to its food, &c. As very little seems to be known about this species of toad, such information would, I think, be of general interest.—*J. Perrycap.*

DOGS AFFECTED BY SOUND OF MUSIC.—A black-and-tan terrier that we kept for some time was particularly sensitive to music. Although scales played on the piano made her yell piteously it was by the concertina's sweet influences that she was most affected, flying before it and if unable to leave the room, whining until the tune was stopped. A Spitzbergen dog-friend of ours is much excited by music, but when

one tune is played its excitement is more marked—the tune is "Bonny Dundee." Dogs are not peculiar in their feeling for music, witness the fact that retired cavalry horses obey the call of the bugle when accidentally heard.—*C. J. W.*

BLACKCAP IN DECEMBER.—On December 17 last I was surprised and interested by seeing a blackcap busily engaged searching for insects among the bare branches of a vine trained against my house. There had been a hard, I should say unusually severe, frost for more than a week, and many even of our winter birds seemed to be pinched and sadly in want of food. The frost was then beginning to give, but I little expected to see so thoroughly a summer visitant able to endure such unusually wintry weather. I watched it for some minutes, and, as it was not three yards from my face, I had no doubt of its being a veritable blackcap. During the months of November and December last a hawfinch was seen nearly every day upon my lawn.—*H. M. M., Badsworth, Weston-super-Mare.*

CORNUS SANGUINEA.—I think it is not unusual for this plant to flower in autumn. I noticed one of our hedges quite gay with its blossoms at that season in last year.—*J. M., New Brompton, Kent.*

TEA STAINS.—Can you tell me why tea produces a blue stain when coming in contact with steel? A little black tea dropped from the tea-pot on a table-knife has this effect.—*R. H. N. B.*

NUTHATCH.—I observed on Friday, March 28, a Nuthatch (*Sitta europæa*) on Barnes Common. Is this not rather a rare bird so near London?—*E. V. Seebohm, Nassau School, Barnes, S.W.*

PARROTS AND THEIR EGGS.—The note in May number on this subject has attracted the attention of a gentleman resident in this neighbourhood, whose parakeet has lately laid three eggs, with an interval of a day or two between each laying—the dates of the events being April 18, 21, 25, of this present year. Thinking that possibly some Manchester naturalists might be glad to see them, he has kindly placed them in my hands to show.—*E. Ward, 29 Burlington Street, Manchester.*

INTELLIGENCE OF ANIMALS.—A very worthy and candid old clergyman of my acquaintance used to tell the following story about some sagacious little dogs of his, in proof, as he was wont to admit, that "they knew, better than himself, how to observe Sunday." In the doctrine of his life he was in the habit of taking a constitutional ride daily; but on Sundays, when he went to perform the service in a neighbouring church, his little dogs, who were his faithful companions on the other days of the week, were not allowed to accompany him. On one special Sunday, having a clerical son staying with him, he gave himself a holiday, and instead of going to serve his church, indulged himself with his ordinary ride. No invitations, however, could persuade the little dogs to go with him. In vain he called; in vain he whistled. They would not break through their good habits, at the cost probably of some little self-denial, and in defiance of the lax example of their master.—*C. W. Bingham.*

INSTINCT OR REASON.—I am not a little surprised that so many of your correspondents question the reasoning powers of animals, or treat as a moot point that on which nearly all the best authorities are agreed. In Professor Huxley's admirable little volume on Hume, recently published, we find the following: "We must admit that Hume does not express himself too strongly when he says, 'no truth appears to

me more evident than that the beasts are endowed with thought and reason as well as men. The arguments are in this case so obvious, that they never escape the most stupid and ignorant.' In fact this is one of the few cases in which the conviction which forces itself upon the stupid and the ignorant, is fortified by the reasonings of the intelligent, and has its foundation deepened by every increase of knowledge." (Huxley's "Hume," p. 104.) From the same volume I must quote another very amusing and suggestive passage. "One of the most curious peculiarities of the dog mind is its inherent snobbishness, shown by the regard paid to external respectability. The dog who barks furiously at a beggar will let a well-dressed man pass him without opposition. Has he not then a 'generic idea' of rags and dirt associated with the idea of aversion, and that of sleek broadcloth associated with the idea of liking?" (Ibid. p. 106.) Probably this trait of canine character has struck most persons who have any dog friends: it is very noticeable what an ineradicable hatred of uniforms dogs show, and very few postmen of any engh of service can be found who will not testify to the doggish detestation which is manifested towards them, however friendly their bearing. In this connection it is interesting to notice how Miss Cobbe finds elevation of character where Professor Huxley finds "snobbishness;" here is her verdict, "A clever dog is one of the best discriminators of character in the world. He distinguishes at a glance a tramp or swell-mobsmen from a gentleman, even in the most soiled attire. He has also a keen sense of the relative importance of persons, and never fails to know who is the master of the house." ("False Beasts and True," p. 158.) Although, as all the world knows, Miss Cobbe is an ultra-enthusiastic pleader for the brute-world, the little work just quoted from affords a storehouse of arguments for the existence of reason in brutes; certainly it is hard to deny them this attribute when we even find them giving way to superstition. "Superstition, or the awe of the unknown, has been treated by some thinkers as the primary germ of religion, and by others, far more justly as its shadow. This shadow certainly falls on the dog no less than on man. The bravest dog will continually show signs of terror at the sight of an object which he does not understand, such as the skin of a dead animal, the snake of a hookah, a pair of bellows, or a rattle. That the brute fancies there is something *uncanny* and preternatural about such things, is apparent from his behaviour, which in a real case of danger is aggressively daring, and in that of imaginary peril abjectly timorous." (Ibid. p. 146.) Turn we to Mr. Darwin, his opinion is very clear, and will have with many the weight of a decision. "Of all the faculties of the human mind," he says, "it will, I presume, be admitted that *reason* stands at the summit. Only a few persons now dispute that animals possess some power of reasoning. Animals may constantly be seen to pause, deliberate, and resolve. It is a significant fact that the more the habits of any particular animal are studied by a naturalist, the more he attributes to reason, and the less to unlearned instincts." ("Descent of Man," 2nd ed. p. 75.) Does not Mr. Wheatley hit on the true distinction between man and the brute-world, when he assigns it to language? And does not Mr. Gilliard venture on a very rash assertion when he says, "it is capable of proof that man cannot act at all intuitively?" It is well known that Professor Max Müller has urged with his usual eloquence that language will yet prove the hard and fast barrier between spirit and matter, between man and brute; let us note then what he

says on the almost settled case of Reason *versus* Instinct. "Some philosophers imagine they have explained everything if they ascribe to brutes instinct instead of intellect. But, if we take these two words in their usual acceptations, they surely do not exclude each other. There are instincts in man as well as in brutes. A child takes his mother's breast by instinct, the spider weaves his net by instinct; the bee builds her cell by instinct. . . . But what if we tear a spider's web and see the spider examining the mischief that is done, and either giving up his work in despair, or endeavouring to mend it as well as may be? Surely here we have the instinct of weaving controlled by observation, by comparison, by reflection, by judgment. Instinct, whether mechanical or moral, is more prominent in brutes than in man, but it exists in both, as much as intellect is shared by both." ("Lectures on the Science of Language," 9th ed. vol. i. p. 402.) Perhaps the latest and most startling theory, stated with a grotesque naïveté which has a bewildering charm, is that of Mr. Samuel Butler, who, in his powerful book called "Life and Habit," boldly says that "instinct is inherited memory." It is unfair to tear from the texture of his ingenious argument and elaborate illustration isolated passages, but the following samples will perhaps whet the appetites of those interested in the subject. Touching on the inveteracy of habit, and the difficulty of breaking away from "The grey nurses Use and Wont," he says, "In our own case, the habit of breathing like a fish through gills may serve as an example. We have now left off this habit, yet we did it formerly, for so many generations, that we still do it a little, it still crosses our embryological existence like a faint memory or dream, for not easily is an inveterate habit broken." ("Life and Habit," p. 70.) Again, "The action of embryo making its way up in the world from a simple cell to a baby, developing for itself eyes, ears, hands, and feet while yet unborn, proves to be exactly of one and the same kind as that of a man of fifty who goes into the city and tells his broker to buy him so many Great Northern A shares." And this, "The duckling hatched by the hen makes straight for water. In what conceivable way can we account for this, except on the supposition that the duckling knows perfectly well what it can and what it cannot do with water, owing to its recollection of what it did when it was still one individuality with its parents, and hence when it was a duckling before." Taking such passages as this by themselves we might be tempted to doubt with the "Saturday Review," whether Mr. Butler was not palming off a big joke on the public, but carefully read, the impression is more likely to be that of Mr. Wallace, and this distinguished naturalist sees in "Life and Habit" much sound speculation and vital truth.—James Hooper, Denmark Hill, S.E.

INTELLIGENCE IN ANIMALS.—"It is quite clear" (says Dr. Whately) "that if such acts were done by man they would be regarded as an exercise of reason, and I do not know why, when performed by brutes, evidently by a similar process, so far as can be judged, they should not bear the same name. To talk of a cat's having instinct to pull a bell when desirous of going out at the door . . . would be to use words at random." And I think many would agree with the learned archbishop if they would carefully consider the testimonies and researches of such eminent naturalists and thinkers as Locke, the philosopher, Bacon and Burns, Professors Darwin, Huber, Brehm, Rengger, Kirby and Lord, F.Z.S., Rev. F.O. Morris, Lubbock, and the lately recognised genius Edward, of Banff, &c. As an example, of which so many can

be adduced, let us take an incident related by Mr. Edward : he saw two birds vainly trying to turn over a large fish on the sands to get the vermin beneath ; after many futile attempts, extending over half an hour or more, and after attracting a third bird who helped them to no purpose, they stood together and apparently by their noise were engaged in some mysterious process of conversation and reasoning, they again set to work eagerly, and dug a hole in the sands from one side of the fish, even to undermining a certain distance, and then, with evident expressions of triumph, rolled it over with ease, and commenced the feast they had worked for. That fish measured $3\frac{1}{2}$ feet, being a fine cod, and those birds undoubtedly used their reason to elaborate a scheme to accomplish their object. Without running off into Darwinian theories, I would remind Dr. Keegan, seeing he lays so much stress on the *capacity* of the brain, that one of our great physiologists tells us—"That every chief fissure and fold of the brain of man has its analogy in that of the ourang:" and Huxley adds, "Whilst in those things in which the brains of men and apes do differ, there is also a great difference among various men." It is true structure is not all—the machinery may be perfect in every detail, yet, if it lack the motive power, of what avail is it? Still, is it not reasonable to suppose that structure being so similar, God intended the ape to use his brain like man's, but in a less degree? The chief obstacle to belief in the reasoning power of animals lies in the fear of what the admission may lead to, but surely we need not grudge to these poor brutes the possession of a feeble development of reason, when man, and man alone, can thank his Creator for giving him a hope of a future which no animal seems destined to enjoy.—*John H. Wilson.*

INTELLIGENCE IN ANIMALS.—I heard a singular story of a Skye terrier, which was told me by a lady-friend who knows the dog well ; it was a great pet with its master. On one occasion its master brought home a puppy of another breed. On its introduction into the house, the Skye terrier appeared to take no notice of it whatever. After a few days the puppy could nowhere be found, and on making inquiry, the gardener said he remembered seeing the Skye terrier smoothing some earth down on the top of a rubbish heap in the garden, and on examining the said heap, the body of the puppy was found buried some depth. The Skye terrier, being jealous of the notice the puppy received from its master, had enticed the puppy to the heap, killed and then buried it.—*Edmund Durrant.*

SAGACITY OF A TREE-CREEPER.—Anecdotes tending to show some sort of reasoning power in the more sagacious quadrupeds are not uncommon, but the following having reference to that diminutive bird the common creeper (*Certhia familiaris*) is interesting as proving these faculties to be possessed by others than dogs, horses, and animals of comparatively complicated brain-structure. Within the last few days we have seen the nest of one of these creatures very snugly placed within a hole in a wall caused by the removal of an entire brick, the breach being partially and to all appearance almost entirely filled up by a portion of the same placed loosely in front. As the movements of the small parents were a source of interest to the proprietor, the loose piece had frequently been removed, and the privacy of the hen bird had been invaded by more than one pair of curious eyes, until she was so far familiarised to the intrusion as to remain undisturbed on her eggs while under inspection. Her mate, however, does not seem to have shared her confidence and determined

to put an end, if possible, to these unwelcome visits. He would fasten the half brick as other bricks were fastened, and, failing mortar, placed in the crack as much well-kneaded clay as he could accumulate. This is the more remarkable as the bird uses no cement of any kind in making its nest. The work though small in extent was as well executed as though a swallow had been the engineer. But alas ! it was easily broken by human hands, and the work of the architect must be recommenced. I grieve to add that, after a second earthwork had in like manner been constructed, the ingenuity and perseverance of the bird could no longer be tried, for at this stage some unknown person robbed the birds of the eggs. *J. J. Plummer.*

CAN WORMS CRAWL BACKWARDS?—My attention having been drawn to this subject by a note in the May number of this valuable magazine, I have experimented with the result that they *can* crawl backwards, though very reluctantly. When experimenting, I tried to make a worm crawl along a narrow path, and every time it turned its head from the straight course, I gave it a gentle reminder on the head with a piece of stick. After sundry knocks, it came to the wise conclusion that it would rather crawl backwards than be hit in this way. It then crawled backwards about three feet. I have experimented on other worms, and in different ways, always with the same result, viz. : that they *can* crawl backwards.—*Percy A. Ramage, Stoneclough, near Manchester.*

SNAKES.—I caught an ordinary brown snake in Epping Forest lately, and as it was rather longer than ordinary (2 feet 6 inches) I determined to stuff it. As I could not get any ordinary naturalist to undertake it (!) I did it myself. After skinning it, I threw the skin into some hot water with some washing soda in it to get off some of the fat adhering to it ; immediately it was immersed, all the brown scales changed to a bright light blue and the darker shades to a beautiful black. How is this to be accounted for? It was not the new skin, but a perfect change of colour.—*J. D. Hardy, Clapton.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

G. H. STEWARD.—You will find an outline of all the great changes which our planet has experienced, physical and vital, in Taylor's "Geological Stories," 4th edition, published by Hardwicke & Bogue, 192 Piccadilly, W., price 4s.

J. C. GLOUGH.—Your plant is the beautiful Water avens (*Gemma rivale*).

J. W. AND OTHERS.—Egg-drills, &c., may be procured of Mr. R. B. Spalding, 46 High Street, Notting Hill, London, W.

R. T. LEWIS.—Many thanks for your generous and prompt answers.

L. HAWKINS.—We are always willing to assist students in naming specimens, and it is a genuine pleasure to do so. The remarks made were those of the gentleman to whom your specimens were forwarded.

W. A. FIRTH.—Your seaweed is *Ptilota plumosa*.
F. H. ARNOLD.—We do not think it "hopeless" to secure you the sedges you require.

TO BOTANICAL EXCHANGE CLUB MEMBERS.—The former list of desiderata will remain open for the present year.

W. M. H.—The "knots" in the straw of wheat are the solid nodes which are common to all the grass family throughout the world.

E. PRITCHARD.—Dr. Carpenter's "Animal Physiology" (last edition); Huxley & Martin's "Text-Book of Physiology"; Dr. Nicholson's "Manual of Zoology"; Huxley's "Lessons in Elementary Physiology," and Wilson's "Zoology" (published by Chambers) are all good books for the object you seek.

H. R. MOISER.—The list of desiderata for the Botanical Exchange Club has not been sent out this year, as it was thought that of last summer might stand.

T. W. HARRIS.—Your shells are *Clausilia rugosa*. Get Tate's "British Mollusks," coloured illustrations, price 6s. London: Hardwicke & Bogue.

J. ELKINGTON.—The specimens are (1) the round sea-urchin (*Echinus sphaera*), and (2) the purple-tipped sea-urchin (*Echinus miliaris*).

P. R. V.—Your flower is *Fritillaria meleagris*.

J. J. T.—The only place where coralline crag fossils can be obtained is Orford in Suffolk.

R. BROWN.—Get Dr. Cooke's "Microscopic Fungi," published by Hardwicke & Bogue, with coloured plates, &c., at 6s.

W. B. SCOTT (Chudleigh).—Wishes some reader of SCIENCE-GOSSIP to send him specimens of the natterjack toad and the crested newt (*Triton cristatus*).

B. M. W.—Your specimen is not a lichen, but the mycelia of a fungus which is common on the walls of wine-cellars.

MRS. EDWARDS and REV. C. F. W. T. WILLIAMS.—Accept our best thanks for the botanical specimens forwarded to us.

MR. J. G. OSBORNE, who is engaged in some observations on the development of the embryo in invertebrate ova, wishes to know of some preparation which would render the structures more transparent, and arrest and preserve them at different stages (see article in our March number on "Preserving delicate Organisms," and paragraph in this number under head of "Microscopy").

EXCHANGES.

WANTED, unset specimens of British Spiculiferous Hymenoptera, especially the Chalcididae. Well-mounted slides of vegetable tissues stained in two colours, offered in exchange.—Charles Vance Smith, Carmarthen.

For specimen of *Peridermium Pini* (rare in England), send stamped addressed envelope and object of interest to Charles F. W. T. Williams, 4 Darlington Place, Bathwick Hill, Bath.

FINE American Lower Silurian and Devonian fossils, in exchange for British Mesozoic fossils.—A. B. Baker, 2 College Ave, Rochester, New York, U.S.A.

THE "Dictionary of Mechanics" (E. H. Knight), 29 numbers to date, offered in exchange for 1874, 1875, and 1876 of SCIENCE-GOSSIP, or work on natural history.—R. L. Hawkins, Hastings.

LIBERAL exchange in first-class objects, offered for a pure gathering of *Volvox globator*. Communicate before sending.—E. Wheeler, 48 Tollington Road, Holloway, N.

WANTED, freshly-collected insects for microscopic purposes, in exchange for unmounted objects, curiosities, &c.; four varieties, Japanese cloth, for one well-mounted slide, curious structure.—Tyler, 165 Well Street, Birmingham.

WANTED, Turton's "Linnaeus," vol. i. 1806.—W. E. Milner, 47 Park Road, Haverstock Hill, N.W.

Duplicate eggs of capercaillie, common sandpiper, common snipe, black-tailed godwit, spoonbill, heron, little bittern, moorhen, coot, sheldrake, razor-bill, guillemot, and black-headed gull, all side-blown. List of what is required in exchange, will be sent on application to R. Davenport, 124 Georgiana Street, Bury, Lancashire.

For micro slides, saloon pistol, by Hollis & Sons, with ammunition, new in February.—J. G. Johnson, 93 St. James' Street, Newport, Isle of Wight.

BRITISH SHELLS. Duplicates for exchanged. List sent on application to J. W. Cundall, Carrville, Alexandra Park, Redland, Bristol.

WANTED, Sciopticon, or other good form of lantern, also Darwin's "Insectivorous Plants," loan or otherwise. Have many things to offer, such as micro slides, first-class, unmounted prepared material, mostly marine organisms in great variety. Marine algae for balsam or herbarium specimens, living plants, alpinus, ferns, Drosera, &c. State wants; will take cash or other exchanges.—T. McGann, Burren, Ireland.

WANTED, Devonian corals, named or unnamed. Fossils from other formations given in exchange.—William Quarterman, 2 King Street, Borough, S.E.

SPLENDID specimens of Marcasite var. cockscomb, for other minerals (cabinet specimens) or fossils. A few fine slide specimens of flexible corals (*Pterogorgia pinnata*). Want fossils or minerals.—J. McKenzie, Nursery Cottage, Berkby, Huddersfield.

For well-mounted slide, I will send diatomaceous mud from peat, very rich.—W. Sim, Gourdas, Fyvie, N.B.

LIVE moles wanted.—J. E. Palmer, 35 James Street, Dublin.
GOOD specimens (side blown) of the following eggs, in guillemot for other good eggs or Lepidoptera. Elder duck, guillemot, lesser B. E. gull, herring gull, cormorant and sandwich, Arctic and common tern.—Adamson Rhagg, 21 Grainger Street, Newcastle-upon-Tyne.

POLLEN of *Calla Ethiopica*, *Amaryllis*, &c., mounted in balsam. Also several hundred silkworms (*B. mori*), to exchange for algae, herbarium, zoophyte, shells, or any unmounted objects of interest.—Mrs. Skilton, 21 London Road, Brentford, Middlesex.

MORRIS' "British Birds," and "Nests and Eggs," wanted in numbers. Books or cash in exchange.—G., 44 Hillmarton Road, Holloway, N.

FOR specimen of *C. hastata* (Australian zoophyte) for mounting, send well-mounted slide. Having means of sending parcels to, and receiving from, foreign countries free of charge, I am anxious for foreign correspondence.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

VERY fine slides of anchors, and plates of *Synapta Gallienica*, selected and arranged in various symmetrical patterns, likewise a few diatom slides arranged in different designs, in exchange for really good unmounted microscopic material. Would like to correspond with some microscopist in the locality of Torquay, with a view to mutual exchanges.—W. White, 18 Convent Street, Nottingham.

NICELY-FINISHED slide of *Acilius sulcatus*, dissected (several pieces under cover) offered for first-class slide of picked diatoms, or rock sections.—J. Neville, Wellington Road, Houndsworth, Birmingham.

PART of a jaw of an Ichthyosaurus from Lyme Regis. Will take exchange in fossils. Write for particulars.—W. T. Ord, 13 Royal Park, Clifton, Bristol.

FOR *Aedium tragopogonis* (goats' beard cluster cap), send stamped envelope to T. Brittan, 52 Park Street, Green Heys, Manchester. No exchange required.

WELL-MOUNTED slides, good unmounted material, and British shells, offered in exchange for shells, British and foreign, and books (on plants and natural history subjects preferred).—E. R. F., 82 Abbey Street, Faversham.

BRITISH BIRDS' EGGS.—Guillemot, razor-bill, kittiwake, oyster-catcher, redshank, carrion crow, magpie, red-backed shrike, &c., to exchange for owl, plover, tern, woodpecker, or any not in collection. Only side-blown eggs required. Lists to J. Wrangham, 93 Tyrwhitt Road, New Cross, London, S.E.

BOOKS, ETC., RECEIVED.

"Outlines of Field Geology." By Professor Geikie. London: Macmillan.

"Practical Photography." By O. E. Wheeler. London: Bazaar Office.

"Greenhouse Flowers." Part i.

"Il Principio della Sapienza," per A. P. Mauro. Naples.

"Proceedings of Academy of Natural Sciences." Philadelphia.

"New Remedies," 3 and 4, vol. viii. New York.

"Science News." New York.

"Feuille des Jeunes Naturalistes."

"Bulletin de la Société Belge de Micrographie."

"Journal of Forestry." No. 26.

"American Naturalist." June.

"Canadian Entomologist." June.

"Land and Water." June.

NATURAL HISTORY RAMBLES.

"Lane and Field." By the Rev. J. G. Wood, M.A.

"The Woodlands." By M. C. Cooke, M.A., LL.D.

"Lakes and Rivers." By C. O. Groom Napier, F.G.S.

"Mountain and Moor." By J. E. Taylor, Esq., F.L.S., F.G.S., Editor of SCIENCE-GOSSIP.

"Underground." By J. E. Taylor, Esq., F.L.S., F.G.S., Editor of SCIENCE-GOSSIP.

"The Sea-shore." By Professor P. Martin Duncan, M.B.

(London), F.R.S.

Society for Promoting Christian Knowledge 77 Great Queen

Street, London.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—

T. W. D.—G. C. D.—E. E. E.—J. W., jun.—J. O. B.—Dr.

P. Q. K.—F. I. G.—J. H. W.—W. L.—J. D.—W. R.—J. H.

W. T.—A. C.—E. D.—C. R. S.—F. W. R.—G. H. S.—C. B.

E. W.—J. G. B.—J. G. D.—A. B. H.—R. M.—G. C.—

J. W. T.—Dr. J. A. O.—P. A. R.—E. M.—W. B. A.—J. R.

—I. C. T.—R. L. H.—H. M.—J. J. P.—W. T.—J. H. A.—

A. W.—E. V. S.—J. D. H.—F. W. I.—W. M.—J. C. C.—

G. D. S.—J. W. T.—B. J. H.—A. H. W.—E. M.—

R. T. L.—J. R. H.—A. T.—S. B.—J. G. J.—R. S. G.—R. D.—

M. H. R.—A. W. H.—D. B.—T. McG.—J. W. C.—G. O. H.—

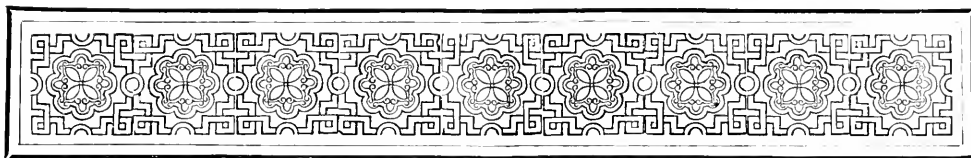
R. L. H.—L. C.—W. A. F.—J. N.—W. T. O.—W. W.—

W. H. G.—B. S.—W. S.—B. M.—W. W.—T. M.—S.—

A. R.—G. S. D.—J. M. W.—J. E. F.—J. S.—J. McK.—J. W. S.—

W. Q.—T. E.—F. H. A.—Dr. M.—W. B.—E. P.—K. M. J.—

E. R. F.—J. C., jun.—F. W. H.—&c.



THE GEOLOGY OF SHEFFIELD.

By T. V. HOLMES, F.G.S., H.M.'s GEOLOGICAL SURVEY.



SHEFFIELD is selected this year as the meeting-place of the British Association, and as geological excursions always form one of the pleasantest parts of the Association's programme to the majority of members, the following notes on the geology of the district may possibly be of service.

It is true that the recently-published Memoir of

the Geological Survey on the Yorkshire coalfield leaves little to be desired by the mining engineer or colliery proprietor, to whom full and accurate information on all points connected with the coalfield is the one thing needed. But its size and price must ever deter persons simply desirous of making the most of their week at Sheffield with the British Association from attempting to acquire information from such a source. In addition, the geology of the Ordnance quarter sheet (82 N.W.) in which Sheffield stands, is not explained in a brief memoir of thirty or forty pages, on account of the Derbyshire part of it not having yet been mapped by the Ordnance Survey on the scale of six inches to a mile.

A glance at a general geological map of England and Wales, such as that of Professor Ramsay, shows Sheffield standing not far from the centre of the great Yorkshire and Derbyshire coalfield. This coalfield, measured along a line ranging north and south from a point about ten miles west of Nottingham to the eastern suburbs of Leeds, is about sixty-five miles in length. Its breadth at the northern end, immediately south of

Leeds and Bradford, is twenty-one or twenty-two miles. It gradually narrows southward, being at Sheffield about thirteen miles wide (due east and west), and varying in Derbyshire from seven to ten miles. On its eastern margin it is overlaid unconformably by the magnesian limestone (Permian). On the west the coal measures rest on the series of thick coarse sandstone with interbedded shales, and occasionally a thin coal, known collectively as millstone grit. This millstone grit forms the high bare moorland which, from the Peak of Derbyshire northward, divides the coalfields of Yorkshire and Lancashire. South of the Peak the underlying Yoredale beds and carboniferous limestone are exposed, but too far from Sheffield to come within the scope of this paper. The five great sandstones of the millstone grit hereabouts are: the first (or highest) grit, or rough rock; the second, third, fourth, and fifth grits; the two last being also called the upper and lower Kinderscout grits. The coal measures are divided into the lower coal measures, or beds below the Silkstone coal, and the middle coal measures, which include almost all the coals of any importance. In addition may be mentioned the only rocks classed as upper coal measures, the red beds with coal plants seen at Conisborough Pottery. Most of the upper coal measures were removed from the coalfield by denudation, previous to the unconformable deposition of the magnesian limestone above the carboniferous strata.

The lower coal measures are more remarkable for massive sandstones forming well-marked escarpments than for coals. Few of the coals are of more than local importance. The Ganister and Whinmoor coals are the only ones of this series worthy of notice about Sheffield. In the middle coal measures the Silkstone coal, the lowest of the important beds, is perhaps the first in point of reputation, the Barnsley coal being held in little less esteem. Other coals exist, between these two and above the Barnsley, of fair thickness and quality, but they are not worked in this locality, from their inability to compete with the Silkstone and Barnsley seams, which have no rivals

about Sheffield and Barnsley. Coals with other names, and on different horizons, are worked about Wakefield and Leeds, Halifax and Bradford.

Then, above these measures rich in coal, we have, towards the upper or eastern boundary of the coalfield, a series of measures with few coals and few thick or massive sandstones. The escarpments made by the sandstones in this part of the coal measures are, consequently, usually feeble and indefinite, giving rise to a slightly undulating country in which no beds are traceable for more than a short distance. Two rocks, however, are not without a perceptible influence on the landscape east of Sheffield, and are also largely quarried. These are the Wickersley Rock, much used for grindstones, and the red rock of Rotherham. The last is a sandstone of Carboniferous, and not, as used to be supposed, of Permian age, which rests unconformably on the beds below, and is altogether perhaps the most singular geological phenomenon in the district. A more detailed account will shortly be given of it.

The lowest beds of the district, the millstone grit, may easily be reached from Sheffield, as the lower coal measure belt of country is much narrower than usual due west of that town. Leaving Sheffield in a westerly direction by the Glossop road, the outcrop of the Silkstone coal is passed near the spot at which Gell Street crosses, and we are on lower coal measures. A gradual ascent in the same direction brings us to Stephen Hill, near which the fault, ranging north-east and south-west, crosses the road, which here divides the lower coal measures from the millstone grit. The road hitherto has been a gradual ascent, and is here about 774 feet above the level of the sea, the height of the alluvial flat of the Don at the Wicker being 150 feet. Hence a gentle descent of half a mile brings us to the edge of the Rivelin valley, and the brow of the fine escarpment of the Third Grit, which here is conspicuous on both sides of the valley, and which, though west of Bell Hagg, and a corresponding point on the north side, has its base 200 or 300 feet above the stream, soon descends to its level eastward at Little London Wheel. The nature of this coarse, massive grit and conglomerate is shown in Bell Hagg quarry. The view from this point is very wild and romantic. Few spots, if any, excel the Rivelin valley as an example of the influence of subaerial denudation in the erosion of river valleys, as we now see them, and the production of escarpments. I may here also remark, by the way, that few influences are likely to be more efficient in removing any notion that may linger in the mind as to the influence of faults in the production of river valleys than an inspection of the Geological Survey maps of coal measure districts, especially those of six inches to a mile. Of course, I do not mean that it will be found that faults never coincide with river valleys, but that they show no preference for them, and that the number of faults ranging along them is

not, on the average, greater than in other parts of the map.

The millstone grit is, about Sheffield, generally divided from the lower coal measures by faults. These lower coal measures are somewhat intermediate in character between the millstone grit and the middle coal measures. South of the Don and west of the Sheaf, the middle coal measures occupy less than a square mile of ground, this being the area between the Don, Sheaf, and Porter Brook, on which the chief business streets and buildings are situated. The lower coal measures occupy all the ground around the above area. On the south, west of Norfolk Park, about Heeley and Bannercross; west, about Crookes and Crookes Moor, and, crossing the Don, a large area west of Pitsmoor is all lower coal measure ground. A short distance south-west of Sheffield, and north-east of Ecclesall Bierlow, may be seen the fine escarpment of Brincliffe Edge, the most striking of those of the lower coal measures in the immediate vicinity of Sheffield. Parallel to it, but nearer Sheffield, and consequently above it, is a sandstone, the escarpment of which, though clearly defined, is comparatively feeble. These two rocks are worth noting here, as they are the representatives of the two most important and persistent sandstones of the lower coal measures. The Brincliffe Edge sandstone is known, north-west of Sheffield, as the Greenmoor Rock, and further north, again, as the Elland Flagstone. It is compact and fine-grained. The uppermost of the two sandstones (which forms Machon Bank) is known north-west of Sheffield as the Grenoside Rock. It is a rough gritty stone, and though not so persistent as the Greenmoor Rock, makes a much bolder escarpment, and covers much more ground, about Grenoside and Wortley. East of the Sheaf at Heeley it rapidly dies away. The variations in the relative preponderance of these two rocks in the landscape, and in the heights of the bases of their escarpments are very remarkable.

North-west of Sheffield few excursions will repay the lover of geology and scenery better than one to Wharnccliffe Crags. These crags are the escarpment of a rock of lower coal measure age lying below the Greenmoor and Grenoside rocks, which are a few hundred yards east of it, and may be seen at the same time. Unlike them, however, the Wharnccliffe rock sinks into insignificance a very short distance north and south of the crags, though at the crags it is a hard, massive, thick-bedded sandstone. The view westward from near Wharnccliffe Lodge is very fine, and will not readily be forgotten. The Don runs several hundred feet below, but its course is almost invisible on account of the mass of verdure which fills the river valley as high as the foot of the crags, and contrasts with the high bare moorland beyond. It is also worth while to take a short walk eastward from the crags, and, crossing the Greenmoor Rock, here insignificant in appearance compared with the

Grenoside beyond, to enjoy the view from the crest of the Grenoside escarpment over the rich but flatter country on the east towards Rotherham.

Though at Wharnccliffe Crags we are at the abode of the "Dragon of Wantley," the tale of whose destruction by More of More Hall, is familiar to readers of Percy's "Reliques," the geologically instructed visitor will not expect to find a magnificent cavern in the sandstone at the spot where the words "Dragon's Den" appear on the map. All that exists is an open joint in the crag, large enough for the accommodation of a serpent, but not for that of an animal of any size provided with legs. The line of the ballad describing the locality

"In Yorkshire, near fair Rotherham,"

gives us a glimpse of the relative importance of Sheffield and Rotherham at the time it was written, the distance of the "Dragon's Den" from Rotherham being rather greater than that from Sheffield; it is the more noticeable as Sheffield was then, as now, a seat of the hardware manufacture:

"But first he went, new armour to
Bespeak at Sheffield town."

No other lower coal measure rocks deserve notice in a sketch like this; it will therefore be best now to proceed to consider the middle coal measures.

A glance at the map (one inch) of the Geological Survey (82 N. W.) shows the strike (that is the direction of the lines of outcrop) of the middle coal measures, south of Sheffield, to be from north-west to south-east. But from Sheffield northward two great faults, throwing down the measures between them, alter the strike of the beds so much that their outcrops are at right angles to their direction immediately south of Sheffield, viz. south-west and north-east, which is also the direction of the lines of fault. These two faults are known as the northerly and southerly Don faults. The northerly fault ranges from half to two-thirds of a mile west of the alluvium of the Don. The southerly fault is, roughly speaking, parallel to the northerly fault, and for some distance keeps on or close to the river and its alluvial flats. The Silkstone and Parkgate coals recover their former line of strike about three miles north of Sheffield, but some of the higher beds retain the strike induced by the faults for a much greater distance. The Parkgate coal lately mentioned is the first coal of any importance met with above the Silkstone, which is about 300 feet below it. The Silkstone and Parkgate rocks, which overlie the coals so named, form, with the measures between them, the steep hillside east of the Sheaf, on top of which St. John's church stands, and may be traced in a south-easterly direction, towards Norfolk Park and Intake. From the top of this hillside, which is capped by the Parkgate rock, a fine view may be had both eastward and westward. From this point there is a gradual decrease, on the whole, in the average height of the sandstone ridges eastward, which continues till the magnesian lime-

stone escarpment bounding the coalfield is reached. The red rock of Rotherham, however, imparts a more than average height to the strip of ground covered by it, and forms a more or less picturesque ingredient in the landscape, though it never attains a height that would be thought considerable in the lower coal measures.

To reach the red rock from Sheffield it will be necessary to cross the outcrops of all the more important coals lying above the Silkstone, among which may be mentioned, in ascending order, the Swallow Wood, Barnsley, and High Hazles coals, whose outcrops range north-west and south-east, in the tract of country between the Parkgate rock and the Rother.

The red rock, as already mentioned, rests unconformably on the beds below, and is distinguished also from almost all other coal measure sandstones by its red or reddish colour. The only other exceptions to the uniformly buff, or whitish-brown tint of carboniferous sandstones, are found in a rock lying above the Wickersley Rock, in the neighbourhood of Brampton-en-le-Morthen, and in the Wickersley sandstone in Ravensfield Park. The Brampton Rock may be seen at Sawn Moors and Pickles quarries. This red colour has never, I believe, been seen except, as in these cases, in rocks high up in the series.

The red rock covers a strip of country of very variable width, though seldom more than a mile, between Rotherham and Harthill, south of Kiveton Park railway station. It is sometimes found in two beds, sometimes as one mass of sandstone. In the excavations made for the Rotherham water-works, near Ulley, irregular bands of red and purple shales were seen interstratified with it. Its total thickness must vary exceedingly. Its carboniferous age is shown in the cutting on the Midland railway, between Masborough and Eckington, about one and a half miles south of the former place. There a coal five inches thick, lying on twelve feet of sandstone of the ordinary coal measure type is seen resting on the red rock; while, on the other hand, near Harthill, the Permian beds are seen lying unconformably above it. At Whiston a coal underlies the red rock, which is in all probability the Herringthorpe coal. But a mile north of Whiston the red rock, in two beds, is seen, judging from the dip, to underlie the Herringthorpe coal. The probable explanation of this anomaly is given in the "Memoir" on the Yorkshire coalfield before alluded to. The red rock may "abut underground against the slope of a denuded hollow," about Herringthorpe. At Whiston, however, "the bottom of the trough is at a higher level than to the north of Herringthorpe, and the red rock is above the coal." At Aston the rock on which Treeton stands, and which may be called the Treeton rock, abuts against the red rock, having been gradually approaching it between Treeton and Aston.

The general conclusion to which we are led by the above facts, and others which might be adduced, is

that the Red Rock fills up a great hollow excavated by denudation; this hollow having a very variable and uneven bottom, and that it lies high in the coal measures, and is unconformable to the rocks below and above it. The Whitehaven sandstone of the Cumberland coalfield occupies probably an analogous position in its locality, and is also, compared with the other carboniferous sandstones about Whitehaven, a red or reddish rock.

The red rock may be visited profitably either about Rotherham or at its southern end, near Kiveton Park railway station, at Harthill. From Kiveton Park station, the villages of north and south Anston with their magnesian limestone quarries, which supplied the stone for the Houses of Parliament and the Jermyn Street Museum, may be easily visited. North of North Anston the spire of Laughton-en-le-Morthen is conspicuous on an outlier of magnesian limestone. A mile north-east of Laughton

concerned—as it did when first erected. How much of this result is due to purity of air, and how much to careful selection of the stone, can hardly be ascertained by us now.

South of Sheffield, the Midland Railway cuttings, both north and south of Dronfield, showed some very interesting coal measure sections ten years ago, when the line was first opened, and I had the advantage of visiting them while new, in the company of Professor A. H. Green. Should any railway-cutting excursion be practicable, those about Dronfield seem to me to deserve the first choice, though there is no want of interesting sections in the railways on other sides of the town.

Once, some years ago, while waiting in a train outside the M. S. and L. railway station, and above the broad street called the Wicker, a fellow-passenger remarked, as he gazed down upon the street, "That would be a fine street if there were any fine buildings

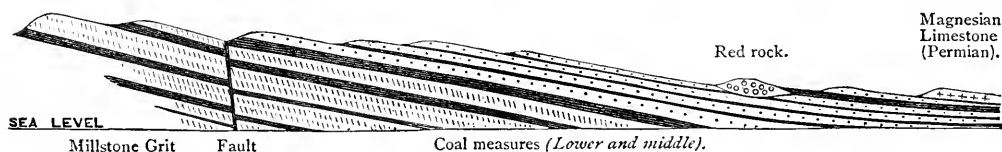
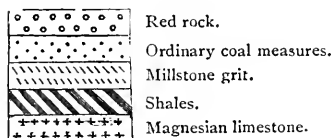


Fig. 135.—Section from a point a little west of Sheffield to the magnesian limestone escarpment.



brings us to the junction of the two beautiful glens at which the remains of Roche Abbey appear. Here two little streams unite and traverse the magnesian limestone escarpment. For the rivers in this part of Yorkshire, the Don, Went, Aire, and Wharfe, all show that apparent fondness for crossing escarpments characteristic of the streams taking their rise in the Wealden area, and doubtless their course has been similarly influenced.

On approaching Rotherham, the visitor will not fail to notice the tree-clad hill at, and southward of, the town. It is crowned by red rock. The places near at which it may be profitably studied have been already mentioned. Continuing our journey towards Conisborough for the purpose of inspecting the upper coal measure plant beds, we again find ourselves close to the magnesian limestone escarpment, which is well seen for some miles at Conisborough, on the right hand, looking northward, and forms a part of one of the most beautiful views in the district. Besides a sight of the magnesian limestone *in situ* we have here a remarkable instance of its excellence as a building stone under favourable conditions. The venerable keep of Conisborough Castle, which is built of it, and is now about 800 years old, looks almost as fresh now—so far as absence of decay in the stone is

in it"—an odd though true remark. A somewhat similar reflection will probably pass through the mind of almost every person who visits Sheffield for the first time; he will think, "This would be a very fine town if there were any fine buildings in it." For the natural picturesqueness of the site of Sheffield is very great—second only perhaps to that of Edinburgh among British towns. Unfortunately its smokiness, the meanness of its public buildings, and indeed of the whole business part of the town, are still more difficult to parallel. The suburbs, however, are extremely pleasant, especially those to the west and south-west, and afford an abundance of fine prospects. A good view of the busy part of the town may be obtained from the neighbourhood of the M. S. and L. Station, looking, of course, southward. On the right is seen the main part of the town surrounding the old parish church, and standing mainly on the Silkstone rock which overlies the Silkstone coal. Farther westward, towards Crookes, are the lower coal measures, which at Crookes attain a height of about 800 feet above the sea, or about 650 feet above the alluvial flats of the Don and Sheaf. Looking, as we do, on the dip slopes of the various beds (the dip being from Crookes to the Sheaf) the fall is gradual and gentle. East of the Sheaf, however, we look not on a dip slope but on the escarpments made by the outcrops of the Silkstone and Parkgate rock, with the measures between them. Hence the contrast which must strike every visitor to Sheffield who sees it from this point of view, between the steepness of the eastern, and the easy slope of the western hillside.

BOTANICAL WORK FOR AUGUST.

UNNOTICED DIFFERENCES IN OUR COMMON PLANTS.

WITH the exception of chickweed, we have few plants so common as the groundsel (*Senecio*) and the dandelion (*Taraxacum*). These are our favourites, at least favourites for all bird fanciers, for they can be met with at every season of the year, but, like most other things which are of frequent occurrence, they are liable to be overlooked by the busy student. Let us, however, bestow a passing thought on these universal species; they assume so many forms and shapes as sometimes to be unrecognisable, except to the prying botanist who has often cast a scrutinising glance upon them.

Common groundsel (*Senecio vulgaris* (L.). We think it not needful to enter into a full description of this well-known species. Many of our readers must have noticed several well-marked forms; it is to these we wish to direct attention.

The type "*vulgaris—proper*," is about 1 foot high, often much branched, with pinnatifid, coarsely-toothed, and succulent leaves.

Sir J. E. Smith describes a species, *S. lividus*, as closely allied to another species, *S. sylvaticus* (Linn.). This, however, never has auricles with the leaves; our first variation from the above type should bear this name:

Var. 1. *Senecio lividus* (Sm.). A much smaller plant than the type, with slender stem, and narrow leaves; very often the flowers are solitary, although we commonly find it with about five.

2. *S. vulgaris* (var. ψ). This is a remarkable plant, which appears to have escaped the attention of the authors of our "Floras." The leaves are all entire, lanceolate and with linear auricles. The plant has the resemblance of *S. sylvaticus* at a distance. It occurs near Penrith, also in several places along the banks of the river Eden.

3. *S. vulgaris* (var. β). A very luxuriant form of the groundsel, occurs on rich loamy soils; the leaves are broad, dark green, sometimes almost pinnate; we however, believe this is not permanent. The variety is certainly reliable, for it comes true from seed. May we beg our botanical collectors to keep one eye open during their rambles for the *Senecio*.

The poor dandelion has been more highly honoured, for it has had as many names almost as a Spanish grandee; here it is known as *Taraxacum*, there we see it *Leontodon*. In the "Student's Flora" the older name is used, *Taraxacum officinale* (Wig.). No common species yields so many varieties as this; for example we find:

1. *T. Dens-leonis* (Desf.). Leaves bright green, broadly runcinate, outer bracts of the involucre recurved.

2. *T. erythrospermum* (Andr.). Leaves dark green, often glaucous, outer bracts spreading.

3. *T. levigatum* (DC.). Leaves dull green, pinnatifid, or cut up into linear segments, generally small, or about 3 or 4 inches in length.

4. *T. palustre* (DC.). Leaves, when in rich soil, entire and deeply-toothed.

The above are all easily recognised; nay, speaking with a learned botanist from Narbonne, he pointedly declared his conviction that Nos. 2 and 3 were good species. The flowers differ so little from the normal form that I do not think they are reliable as characters, although Babington seems to depend much upon the outer bracts; however, flowers can be found where the bracts vary widely on the same plant. The leaves preserve the same peculiar shape under all circumstances; I can with every confidence rely upon them. *T. levigatum* are very peculiar, being cut to the midrib into long linear leaflets. The opposite extreme is seen in *T. palustre*; here the leaves are in some examples quite entire, whilst the rich emerald-green tint of *T. Dens-leonis* can seldom be equalled. Taking it all in all, I know no species so full of interest. In my British herbarium I have about ten sheets filled with this species.

J. F. R.

THE DERBYSHIRE CAVERNS.

UNDOUBTEDLY many visitors to the British Association meeting at Sheffield will avail themselves of the neighbourhood of the Peak (only some twenty miles away) to explore its wonderfully lovely dales and caverns. We extract the following account of the "Speedwell Cavern," at Castleton, from "Geological Essays, and Sketch of the Geology of Manchester and the Neighbourhood," by J. E. Taylor (published in 1864).

The entrance to the "Speedwell" mine is by a door in the hillside, strongly reminding one of that which Bunyan mentions in his "Pilgrim's Progress," as shown to Christian by the shepherds. In at this door one starlight night in February, some four or five of us entered, each laden with a wardrobe of miners' clothing wherewith to bedeck ourselves. Entering at the cottage by the side of the cavern, in which the guide usually lives, we found a cheerful fire burning. We speedily converted this into a dressing room, and then turned out in anything but a photographic condition. I may, observe, however, that the cavern itself, the "Speedwell" mine, does not require this trouble at the hands of ordinary visitors. It is, as the handbills advertise, "quite clean and fit for ladies to visit." There is also an intelligent guide to accompany them, and to point out various objects worthy of remark. Entering in at the door by the hillside, we descended a flight of upwards of a hundred steps, and at the bottom, to our astonishment, found a boat ready to row us along a subterranean passage in which was about three feet of water. There was just sufficient room to sit upright

in the boat without knocking our heads against the top; and along this passage we were rowed for a distance of nearly half a mile, lighting the way as we went by sticking candles against the wall. When we had gone some distance from the place of embarkation we looked behind us and the reflection of the lights in the still water was beautiful, reminding one more than anything else of a long street lit up by gas. This is the passage which was literally hewn out by the muscle and sinews of the miners in their search after lead; and we could see one or two thin veins of that metal crossing the cavern transversely. The stillness, at first, seemed almost unearthly, especially when we coupled with its effect the remembrance that it was night. But, by-and-by, we could hear a faint droning sound. On asking whence it came, we were told to our astonishment, that it was caused by the water upon which we were sailing falling over a cataract into what is called the "bottomless pit." As we proceeded, the noise increased until at length we had to speak in a different note in order to hear each other. We were so completely interested with the uproar that we did not notice the boat had stopped, until one of the company drew our attention to it. A large rock had impeded our course, and to it we moored the boat when we had landed. Raising our candles over our heads we perceived a mighty cavern, whose darkness our feeble lights only seemed to render more obscure. On each side, high as we could look up, huge rocks hung over, as though ready to topple on our heads with the least disturbance.

But the sight was inexpressibly grand when, after lighting a rocket, the hissing and blazing torch mounted upwards for more than three hundred feet without reaching the top. As it ascended, the darkness below became more and more palpable, and the dazzling light above our heads revealed a similar arrangement of rock masses to those which we could see below by the faint light of our candles. The whole effect was most striking, and had much of the character which Martin has thrown into his wonderful picture of the "Great Day of His Wrath." I shall never forget it; that sight has haunted my imagination scores of times since. But we now turn our attention to the falling volumes of water as they dashed over the precipice. This is protected by a strong iron "railing;" and a dazzling "Roman light" held over showed us a yawning chasm, into which the seething waters hurried themselves. We could not see the bottom, although it is known that a communication exists between this and the "Peak cavern," a mile away, for sawdust thrown into this stream has been carried out by the rivulet which flows from the latter cavern. These sights are those usually shown to visitors, and well are they worthy of visitation; for it is seldom that such great natural phenomena are to be found within so short a distance. But, as we passed along by the tunnel to the cavern I have mentioned, we had noticed several small passages

branching out on our right hand, and now we returned to make our explorations in them.

Nobody had entered them for years, and we were making the experiment for the sake of obtaining some rare minerals, which, we had been told, were found on the walls. Each of us was armed with hammers, and with our "toilette" of miner's clothing, were well prepared to "rough" it. So, in returning, we stopped at the mouth of the right-hand passage, called the "Half-way House," and fastened the boat firmly to the rock—for had it chanced to drift away we should have had a quarter of a mile to wade through a stream three or four feet deep, whilst the owner would have had to perform the same feat right to the other end to bring it back. As we got out of the boat we had about a foot of water to wade through, along a narrow and dripping passage, for about a hundred yards, cramping our backs with the constant bending. We were relieved at the end by being able to stand erect in a vast rent in the rocks, extending so far above our heads that the dim light of our candles could not enable us even to guess its height. Between the walls of this fissure, which was three or four feet across, there were bars of wood placed to serve as staves, and fastening our hammers in our belts and sticking our lights in our hats, we mounted up one after the other. It was a somewhat dangerous task, for the bars of wood had been placed there for more than thirty years, and were now rotten from the constant moisture to which they had been subjected, so that if the leading man had made a false step and tumbled down, he would have sent us all before him like a set of skittles. At last, after mounting some hundred feet or more, we reached the top, and found a passage similar to the one along which we had waded, extending in a westerly direction. Along this we made our way with bended backs, with the danger of breaking our shins over an old waggon, which had been left by the miners years ago. Here we could see the lead vein crossing the path, the matrix in which it occurred being filled with cawk or sulphate of barytes in an uncrystallised form.

Farther on, the passage was so narrow that we had to crawl on our knees among mud and débris; all this labour being abundantly recompensed by discovering that, a little further, the masses of rock were covered with crystals of carbonate of lime of various sizes and forms, but chiefly of the "dog-tooth" shape. These presented the appearance of having been dusted with loaf sugar, owing to smaller crystals having been formed upon them. Here we obtained some magnificent specimens, the most curious being a dog-tooth crystal of calcite, with a cubic one of fluor, perfectly blue, mounted on the very apex. Standing out in relief were numerous fossils, long jointed stems of Encrinites, shells of Spirifera, Orthocera, and a host of others. Already the weight behind had bulged out the front part, and the whole seemed as

though it only needed one of the foot-stones to be loosened for it to come thundering down. But if nothing else had repaid our labours, certainly the sight of the magnificent cavern into which we now entered, did so most amply. When we had all got together, we looked around us, and the surrounding scenery was most impressive. The wide vault, hid by the blackest darkness above our heads, the masses of rock at our feet, made us feel like pigmies when gazing upon this work of nature. The effect was more striking when we burnt a Bengal light, which threw out the light and shade of the overhanging masses into splendid relief: the thousands of crystals of various shapes and colours, which reflected the dazzling light in a thousand coruscations, left us almost speechless with astonishment and delight. After attempting to make our way in other directions we had to give up, owing to the passages narrowing so much as to prevent us even from crawling along. In fact, all the hills hereabout are quite hollow, and the subterranean passages extend for miles, widening and narrowing alternately as they run along. Descending in safety we found the boat moored as we had left it, and another quarter of an hour brought us into the clear starlight.

HOW TO FOUND A ROOKERY.

By MRS. TILT.

IN answer to the question that has been asked in your columns as to the best means of founding a rookery, I can mention an instance in which a large one was established by the kindness shown to a solitary rook one severe winter. For many years it had been our great ambition to have a rookery; there were several large ones in other parts of Cheshire, and what was considered to be the mother-rookery was about two miles from us. The keeper had obtained rooks' eggs, placed them in nests in tall trees thought likely to attract them, but all to no purpose. But one severe winter there came regularly every day, with some pet bantams that were fed by the house-keeper out of the window, a solitary rook and fed with them, becoming at last so tame as to hop on the window-sill. In the spring this tame rook brought a mate, and together they began to build in a small Spanish chestnut tree, so close to the house that from the upper windows we could see quite into the nest. It made great excitement watching the progress of this nest, as it is considered to bring good luck to a house when rooks build near it. The nest was about half finished, when, one morning, a great noise was heard, and we saw about a dozen strange rooks violently attacking the old pair, and tearing the nest to pieces. They did not attempt to build again that year, but the next spring the same thing occurred. They got so far as to lay their eggs, when the female bird was suddenly attacked one morning when she

was sitting by a dozen and more of rooks, and the noise was such as to collect the whole household to watch the battle. She made a stout defence, and it was some time before they beat her off the nest, dashing it with its contents to the ground. This was repeated a third year, when we began to despair of having our rookery, but on consulting a book on natural history we found it stated that it was generally four years before a pair were allowed to establish themselves independently from the mother rookery. At all events it was so in this case, for the following year they not only brought up a brood of young birds without being molested, but each year after the nests in the same tree increased in number, and eventually they spread to other trees close by. It was so far satisfactory to have established our rookery, but unfortunately, the grateful rook had chosen the nearest tree to the window where he had been fed, and their close vicinity to the house proved at last so objectionable that it was found necessary to drive them further off, by gradually cutting down the trees they had chosen. With the curious instinct that rooks are supposed to have with regard to trees that are destined to come down, though they were left in peaceful possession of the original tree they had chosen, and which had nine nests in it, they wisely left it, and established themselves in a clump of large trees at a more convenient distance. Every year after this the rookery increased in size, and in the space of ten years, from the time the parent birds made their first attempt to build, the rookery has grown so large that we have been advised to shoot some of them in the spring, for fear the rooks, "becoming too numerous," should fight and break up the colony.

This is only one more instance of the power of man over animals, and shows that the secret of that power is kindness.

ODDITIES AMONG SEA-BIRDS.

By P. Q. KEEGAN, LL.D.

A STRANGE, odd, fantastic, eccentric appearance or deportment exhibited on the part of a human being, or by one of the lower animals, is, under ordinary circumstances, if not pitifully, at least ludicrously interesting. We are deeply conscious that something is wrong somewhere or somehow, that the ordinary rules and dispensations of nature are, in this instance, violated or replaced, their provisions unduly restricted, or inordinately and absurdly overstrained, and the contrast thus furnished, being generally striking, our visible faculties are excited, and we indulge in a burst of laughter. Sometimes in the midst of an accompaniment of differences, we perceive a strange resemblance to some external object. Thus, for instance, when we witness the pranks, gambols, and extravagances of a monkey, we all the while perceive therein a certain

resemblance to the human face, hands, and facial expression, but qualifying this, we observe, at the same time, fundamental diversities in respect of shape, colouring, speech, posture, etc.

But independently of such resemblances and other relations to foreign objects, sundry animals possess certain curious appendages which, either by reason of their excessive and disproportionate size, or of their uncommon shape, colouring, etc., inevitably excite our laughter. Just in the same manner as we jeer and laugh at the drolleries, comicalities, and eccentricities of a clown in the circus, or of a comedian on the stage, so do we feel amused and exhilarated with certain extraordinary appearances, etc., on the part of animals; the extraordinary-looking beaks of the

whole economy of the world depended upon the issue of the process. There is a knowing look, too, about certain animals which is equally interesting. Thus we often say of a certain cat or dog, that he is very wise or knowing-looking. Certain attitudes assumed, or certain movements executed are also irresistibly funny. A young kangaroo popping its head and tail out of its mother's pouch, or vaulting nimbly therein from the ground, furnishes an undoubted ludicrous spectacle.

Within the necessarily restricted limits of a paper of this description, it would be idle to endeavour to



Fig. 135.—The Puffin (*Fratercula arctica*).

toucans, the hornbills, curlews, etc., seem out of all proportion to the size and apparent requirements of these birds. So likewise the long, lank necks and shanks of the cranes, herons, etc., are provocative of merriment, especially when we observe them erect on some desolate sea-shore, as if fixed in thought—in a “brown study,” with the head poked out forwards in a curious “contemplative” attitude.

Some singular fidgety deportment, some extraordinary aspect of eye or countenance, denoting in either case an unnatural, unhealthy excitement, or even an abnormal suppression of animal force, is often very ludicrous to behold. A bird performs some operation (such as that of incubating) with an amount of gravity and an air of importance utterly disproportionate to the consequence or influence thereof in the economy of nature. During the breeding season the Common Guillemot may be observed upon the extremity of some protuberant ledge of rock perched upon a single egg, in such a manner as if the

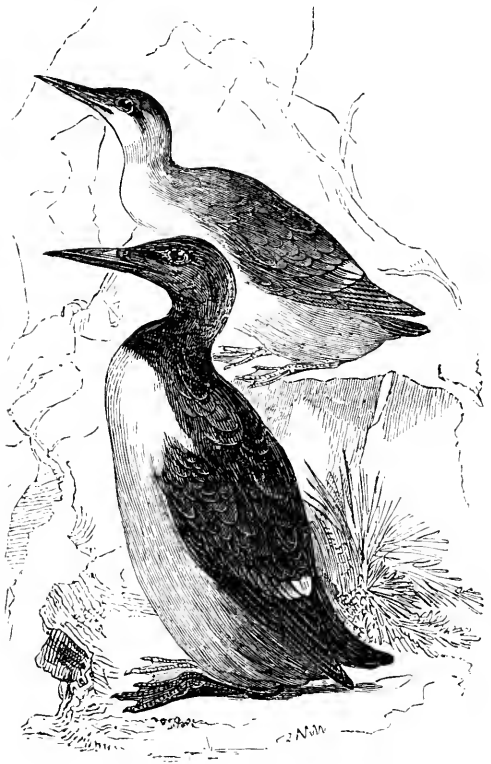


Fig. 137.—The Common Guillemots (*Uria troile*).

investigate the primary or fundamental cause of the aforesaid eccentricities. Nevertheless, in a general way we declare, that just in the same manner as a violent disturbance, or an undue depression of animal or nerve force occasions the extravagant deportment, opinions, and feelings of insanity, so this same excitement and depression, when manifested in a less marked degree, induces the less momentous and intense form of oddity now adverted to. Sea-birds, as a rule, are not particularly odd or funny-looking, either as respects their appearance or their conduct. Nevertheless, there occur very odd and singular creatures amongst them, some of which, and in the first place,

the Puffin (*Fratercula arctica*), I shall now proceed to describe.

Shortly after the occurrence of the vernal equinox, when azure skies and exhilarating gales betoken the advent of spring, away, far out upon the deep, where some desolate, wave-worn islet or islanded cliff towers above the waves, or fast by some dreary sea-shore, flanked by a tall, beetling armoury of inaccessible rocks, vast bands of sea-birds assiduously prosecute their breeding duties. Not surmounting all the seats of the assembled congeners, but ranged in a modest position about the middle of the cliff, there may

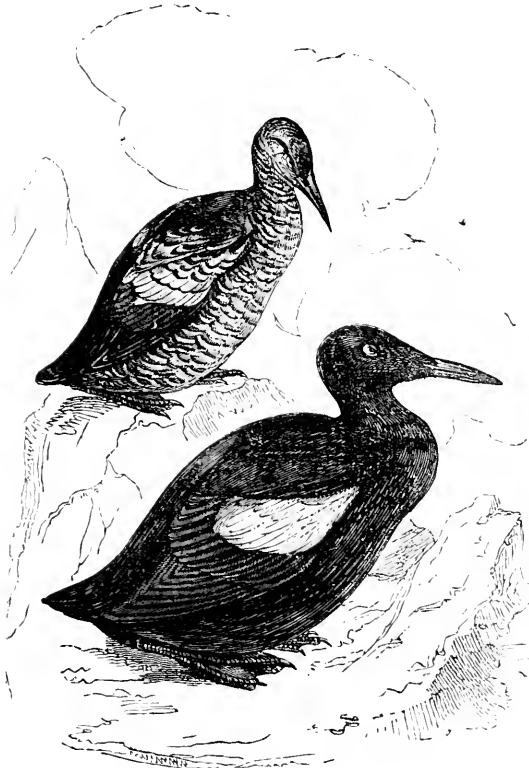


Fig. 138.—The Black Guillemots (*Uria grylle*).

readily be discerned a lengthy array of curious perforations, somewhat resembling an extensive rabbit warren. These are the breeding resorts of the comical little Puffin. Externally everything would seem to be in comparative repose; but just let anybody try the experiment of thrusting his bare hand into one of these holes, and he will have ample reason to repent of the proceeding, for assuredly he will receive a sharp bite from a most formidable, eccentrically-shaped bird beak. Presently the body of the bird to which this curious appendage belongs, will appear and assume a threatening attitude towards the invader of its chosen haunt.

The Puffin is about a foot in length, with black

wings and back; a black collar round the throat; white cheeks, chin and breast; orange legs, blackish-brown claws, and a very comical expression of countenance. The aforesaid beak is sharp at the point, compressed laterally, and bears three grooves on the upper mandible and two on the lower. The colouring of this beak is as fantastic as its shape. The lateral ridge of the upper mandible is greyish-yellow, and that of the lower mandible orange-red, the triangular space in front of both being orange-red and bluish-gray. When inspected from a short distance, it would appear as if somebody out of sport

had clapped a glued and horny mask upon the bird's face, so extraordinary does this beak-like appendage appear. An utter incongruity is perceptible somewhere or other; the face and top of the head are curiously projected, and, at the same time, flattened laterally, a circumstance which imparts to the former an unequivocally ludicrous expression. The appendage, moreover, imparts a species of domineering pomposity to the bird, which seems manifestly incongruous with the size and combative capacities thereof.

But although not particularly handsome, at least so far as form extends, the bill is, nevertheless, eminently useful to the puffin in three ways. In the first place, it is thereby enabled to capture fish. The bird dives expertly, and swims under water by means of the conjoint action of feet and wings, until a desired morsel is securely grasped in its mouth. This is commonly a sprat, or other such fish, and frequently some six or seven (eleven have been seen) of these choice morsels are observed hanging in a row dangling free along the bird's beak, all doomed soon to pass through "red lane." Again, the burrows or breeding holes, already adverted to, are often originally constructed by the male puffin digging and tunnelling with resolute zeal and invincible perseverance, into the sand, until a winding aperture is hollowed out, in some cases eighteen inches, in others, three feet or more in depth.

Frequently, however, the rights of property and of prescriptive possession are not at all respected by this impudent little sea-bird; for when an already constructed rabbit-hole happens to be fixed in a suitable situation, it will take forcible and immediate possession thereof. Nor will it allow its tenure to be disturbed; for after sundry combats with the former denizen, in which, by the way, the sharp beak proves of eminent service, it will violently eject the poor rabbit out of house and home; and, upon the principle that might is right, forthwith and without scruple, instal itself in the vacated seat.

The prodigality of animal life inherent in the sea-birds now under review, is exhibited under the form of great liveliness, smartness of movement, pugnacity,

courage, and general activity (they sometimes travel twenty or thirty miles for food). Amongst human beings we do not commonly encounter displays of oddity amongst the gay and effervescent spirits. On the contrary, peculiarities of manner, opinion, conduct, etc., generally originate in severe, taciturn, grave dispositions, or rather in these when placed in easy circumstances, or when following a career in life (such as that of a sailor) which involves no cankering care, no heart-shaking anxieties, fears, and apprehensions.

The Puffin, too, notwithstanding the apparently malevolent disposition involved in the aforesaid violation of the rights of property vested in rabbits and other animals, manifests at times great kindheartedness and sympathy towards members of its own species. When a flock of these birds happens to be assailed by the fire of the sportsman, and one of them falls wounded or dead into the water, its mate, or even a stranger, is frequently observed to alight and swim round it, vainly endeavouring, by means of pushing and coaxing, to arouse it from that last long sleep that will endure for ever.

An unequivocal oddity of appearance is also exhibited amongst sea-birds in the case of the Black Guillemot (*Uria grylle*), with its long sharp beak, elongated body, legs sticking out behind, and singular white patch upon the wings. In the breeding apparel, the plumage of this bird is entirely tinged with a deep brownish-black shade, which on the upper surface is beautifully glossed with bronze and purplish-red. The quills and secondary feathers of the wings are tipped with grey, and there is an oval patch of pure white upon the wings. The bill is black; the legs and feet are vermilion tinged with carmine, and the claws black. This curious, fantastic distribution of colouring conspires with the peculiarly-shaped, "smart-looking" bill to impart to the bird a ludicrously self-complacent, eminently self-satisfied appearance.

When the breeding duties of this sable sea-bird have terminated, i.e., about the 1st of September or rather earlier, it cheerily betakes itself to a career upon the ocean. Frequently during the autumn and winter months, towards the centre of or impending over Scottish bays, creeks, estuaries, rocky islets, etc., a very oblong, darkly-painted figure may be discerned careering over the surface of the waves. It is of a bird-like shape, with long protruding beak, and legs sticking out prominently behind, and seems flying away in hot haste and with anxious precipitation. Presently, however, this eccentric specimen of animal life alights complacently upon the crest of some breaking wave, and after indulging in a little lively swimming exercise (probably by way of digestive preparation, or appetite sharpening), it suddenly, and apparently for no cogent reason in the world, makes a great splashing with its wings, and then heels over and disappears from view. The bird has descended

into the watery chambers of the ocean in quest of a fish, or some other equally nutritive substance that may serve to quell the ragings of hunger, and to furnish bodily sustenance. As the creature proceeds under water a number of air bubbles cling to its oily plumage; and provided only that the liquid medium be sufficiently quiet and transparent, the spectacle furnished by the moving bird beneath is marvellously beautiful. An oblong, beautifully-modelled, blackly-painted animal form, studded, as it were, with brilliant stars and diamonds, and executing a series of graceful manœuvres down in the sea-green depths, is a spectacle of rare æsthetic interest. But the deportment of this charming little bird upon the surface is none the less interesting. In the wildest sea, when each wave was embossed with a creamy foam, we have seen this bird, with its attendant troupe of young, riding buoyantly and paddling about as if beyond all measure charmed with life and its enjoyments.

The flight of the bird now under review is rapid and continuous, and is characterised, moreover, by a curious revolving, or rather oscillating motion effected in such a manner as to occasion a curious alternation of form and colour. The black painting of the lower parts of the bird is, at one time, exposed to view, and one would think a completely sable animal was being observed. Presently, however, the flying body oscillates slightly, and then the ludicrous wings, with their large, oval-shaped, whitish-coloured patch, come prominently under notice.

(To be continued.)

NOTES ON BLUE FLOWERS.

SIR JOHN LUBBOCK makes the remark that the Bees with which he experimented with a view to obtaining a knowledge of their colour-sense, seemed to have great difficulty in determining between artificial *blue* and *green* colours. It is generally regarded that gamopetalous flowers, or flowers whose petals are united into a single piece, are better adapted for the visits of butterflies and moths than bees. I have been particularly struck with the much greater proportion of *blue* flowers among gamopetalous plants than among polypetalous, which would be comprehensible on the ground that bees could not effectively determine the colour of blue so well as butterflies. In that case we might reasonably expect that blue flowers would have more butterfly than bee visitors, and would have been gradually adapted to the latter rather than to the former. Taking a rough census of the colours of our British flowers, we find that only ten species are marked as "blue" among the polypetalous kinds, and of these some are very doubtfully "blue," such as the Vetches (*Vicia cracca*, *V. sepium*, *V. hirsuta*, *V. tetrasperma*, etc.); for red has been called in as an auxiliary (and red is a very luminous

and far-seen colour) in order to make up some tone of purple. Among the violets, also, we have a tendency to purple and even white varieties, instead of a fixed determination to stick to blue; as if the latter colour had been found not to answer. Those polypetalous flowers which have most faithfully adhered to a blue colour (as regards our British flora) are included in Linacæ. The milkwort is usually called blue, and its blue is of a dark and lovely colour; but every one knows that this plant bears pink and white varieties, in some places quite as commonly as the normal blue flowers. On the other hand, we find that among the gamopetalous division of our British flowering plants, no fewer than fifty-seven species (against ten of the polypetalous) are decidedly blue. In addition, there is quite a host of which I have taken no statistical heed, marked "lilac," "purplish," etc., in which *blue* is a colouring agent. Of the gamopetalous orders Boraginacæ and Campanulacæ are the most conspicuous, the latter bearing little besides blue flowers and possessing corollas of the most typically gamopetalous character. Of course polypetalous flowers are visited by butterflies as well as bees, and it would be interesting to note if the former, rather than the latter, picked out the blue kinds. I only offer these remarks as tentative. Is there anything in them?—*J. E. Taylor.*

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

NO. VIII.

By J. E. TAYLOR, Ph.D., F.L.S., F.G.S., &c.

WE have already seen that, to a great extent, Encrinites occupy the place in the rocks of the Palæozoic epoch which sea-urchins and their allies do in the Secondary strata, and in the seas of the present day. The sea-urchins proper are more abundant now than at any previous period in the world's history. They inhabit every sea, and almost every shallow and depth in the seas. More than at any other time one modern group of them (the Echini) merit the name of Echinodermata, or "spiny-skinned," given to the entire order. The common sea-urchins, such as *Echinus esculenta* or *E. miliaris*, are covered with what are not inaptly called "spines."

The Echinodermata are doubly important, on account of their numerical abundance and wide distribution in the seas of the present day, and their great geological antiquity. We have already noted their general persistence in the rocks of every geological epoch since the Silurian up to our own, and that we find their species and types increasing in number in proportion as we approach the present epoch. The common Sea-urchin (*Echinus miliaris*) is a familiar example. It well deserves its name, for, when alive, it is so thickly covered with spines, as to greatly

resemble the common hedgehog; when dead, these spines peel off, and then the surface is seen covered with minute knobs or tubercles, to each of which a moveable spine was attached, on the principle of the ball-and-socket joint. The shell is composed of carbonate of lime, and is made up of an innumerable number of separate pieces, all of which are mosaicked together. No fewer than six hundred of these go to make up the entire "test," as the shell is technically called. And yet, although in the adult state it may be several inches in diameter, the shell has not been moulted since the animal was no bigger than a pea! There is a membrane lining the exterior of the test or shell, and this has the power of secreting the carbonate of lime diffused through seawater. As the membrane is inserted between every one of the six hundred and more plates, it is able to add lime along the edges of each, and thus the whole structure grows out uniformly and symmetrically, almost like the expanding of a bubble when blown out. A more beautiful architectural contrivance could not be imagined than is thus furnished to us by this insignificant creature!

Take one of the rounded tests you may have picked up at the sea-side, out of which the animal has been removed, and hold it up so that the light may be seen through it. Besides the large apertures at the top and the bottom (anus and mouth) you perceive rows of minute punctures radiating down from the summit to the base. These punctures are called "ambulacral pores," and the plates (of which there are five rows) in which the pores occur are termed "ambulacral plates," for a reason that will shortly be seen. In addition to these, there is a plate specially perforated, called the "madreporiform tubercle" (on account of its being as porous and spongy as the common Madreporite coral), and its office seems to be to admit the sea-water as a filter. From this a sort of canal proceeds *internally* to a tube which surrounds the gullet at the base of the shell or test like a ring. From this circular canal there radiate, like the arms of a star-fish, certain other canals which pass in front of the rows of perforated plates, and meet together at the top. Each of these five canals gives off in its course innumerable tubes, which can be protruded through the little punctures at the will of the animal. At the base of each little water-tube, on the other side of the canal, is a little water-bag, and when this is compressed (as when a boy squeezes a hollow indiarubber ball he has first filled with water) the minute water-tubes, or "ambulacra," are lengthened even beyond the spines of the animal. Myriads of them can thus be protruded whenever the sea-urchin thinks fit, and they may then be seen wriggling and moving about like so many worms. At the base of each is a sucker, and so, when a few scores of the "ambulacra" are thrust forth, and have attached themselves to any object, they are enabled to

warp the entire shell along (fig. 139). It is in this way, in fact, that most of the true Echinodermata crawl along the bottom of the sea. The reverent reader cannot fail to be struck with such a beautiful piece of construction, and a hint might here be furnished to our best hydraulic engineers. That this principle has been in vogue for myriads of years is evident by the similar construction of the ancient sea-urchins. Thus in the

ancient fossils were already in possession of the hydraulic principle which has been of such inestimable value to their race. The *Ananchytes* of the Chalk, however, has very small tubercles, and the spines formerly attached to them must have been very small and bristle-like, as is now the case with those of the living cake-urchin, *Bryssus lyrisfer*, not uncommon in the muddy bottoms of the Kyles of Bute, the *Spatangus*, *Amphidotus*, and many others. This is not the case with the *Cidarids* found fossilised in the Chalk with them. The very large knobs or tubercles on the tests of the latter animals (which are especially abundant in tropical seas at the present time) give support to large spines, of a club-shape generally, and often ornamented by various devices. Their ball-and-socket principle of jointing, however, was in use in, and has been ever since, the geological epoch termed the Silurian, when the Echini were first introduced. In the Oolitic strata we meet with some of the handsomest specimens of *Cidarids*, and what is very peculiar is that, like the fossil Oolitic corals, the fossil *Cidaride* resemble species now living in tropical and

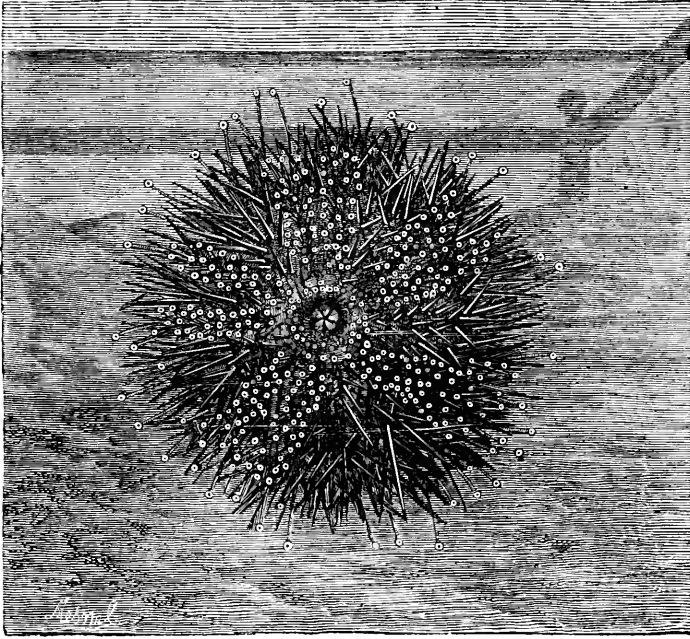


Fig. 139.—*Echinus* climbing glass side of aquarium, and showing mode of attachment of ambulacral sucking feet.

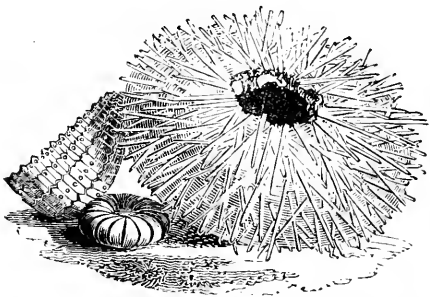


Fig. 140.—*Echinus esculenta*; on left-hand side is a fragment of test denuded of spines, and showing plates.

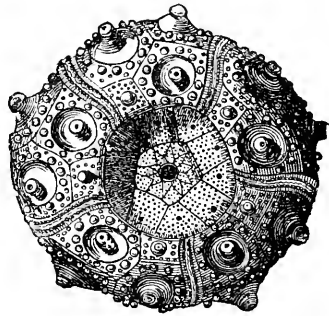


Fig. 141.—Test or shell of *Cidarid coronata*, showing the tubercles to which the bases of spines are attached; Oolitic formation.

“Fairy loaves,” as they are called in the Eastern countries, where they literally abound (the chalk fossils known to geologists as *Ananchytes ovata*), you see five similar rows of perforations; and even the somewhat differently fashioned tests of the earliest genera of sea-urchins (*Palæechinus*), dating from Carboniferous if not from Silurian times, possess perforated ambulacral plates, showing that these very

subtropical seas. The “cake-urchins,” of which our recent British species of *Spatangus* is a well-known example, date from the Cretaceous, or chalk period, for the fossils are so common as to have obtained the popular name of “hearts” in chalk districts. These include both *Spatangus*, and a genus called *Micraster*. In number of species, however, and variety of external form, these Echini

are most abundant in Tertiary strata. It is a peculiar law in the history of a race of organic beings—that they have a period of introduction, one when they reach their maximum, both numerically and in variety of species, and another when these drop off one by one, and the race becomes extinct. We then find that the functions they performed are taken up by some other kindred group of animals, which, as a rule, are more highly endowed and specialised, and so have been able to thrust aside and extinguish their older comrades; just as British weeds are now supplanting the native weeds of New Zealand and elsewhere.

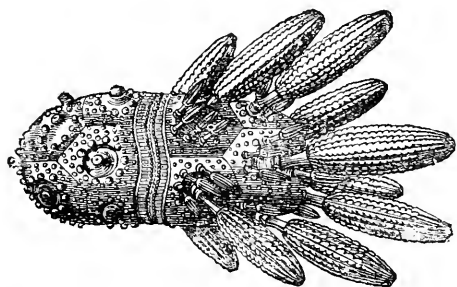


Fig. 142.—*Cidaritis coronata*, showing mode of attachment of the club-shaped spines.

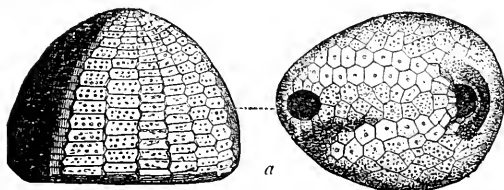


Fig. 143.—*Ananchytes ovata*, or "Fairy loaf"—a common Cretaceous echinoderm; a, base, showing position of mouth and anus.

The nervous system in modern sea-urchins is placed round the mouth, which is furnished with five hard calcareous teeth, to enable it to triturate its food. These teeth are worked by muscles, through loops, and the whole can be removed as easily as an artificial set of teeth. In this state the mechanism goes by the name of "Aristotle's Lantern," and the seaside picker-up of "unconsidered trifles" frequently finds it lying by itself after the more fragile test has been broken to pieces. We have seen silicified specimens of Echini in Chalk flints near Norwich, which have had these teeth fossilised, but such examples are exceedingly rare. Nevertheless it affords another instance of the persistency of a plan. Generally speaking, the larger number of the Echini of the Chalk seas had the mouth and anal aperture at the base, and such genera as *Ananchytes*, *Holaster*, *Micraster*, *Galerites*, etc., are grouped according to the position of these apertures, which is always constant in the same species. In the recent *Echinus*, as

well as in the fossil *Gidarids*, the mouth is at the base and the anal orifice at the summit.

The modern *Bryssus* (as we have already noted) buries itself in very fine mud, on the organic matter of which it appears to feed, just as earthworms do on the black soils. The *Micrasters* and *Spatangi* of the Cretaceous period, which approach the *Bryssus* very nearly, both as to shape and structure, undoubtedly buried themselves in the chalky mud of the ancient sea in a similar manner. Some of the modern *Echini*, on the other hand, appear to have the power of hollowing for themselves holes in the rocks by the sea, especially in limestone rocks, which are not unfrequently found

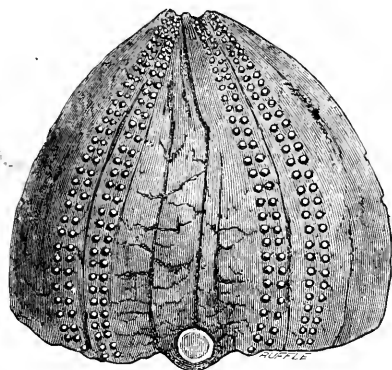


Fig. 144.—Natural flint cast of interior of *Ananchytes*, showing the perforations (in relief) for ambulacral or sucking-feet.

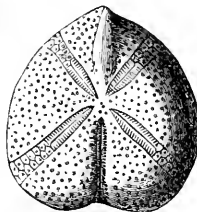


Fig. 145.—*Micraster*, a common Cretaceous echinoderm, showing the petaloid arrangement of the ambulacral areas.

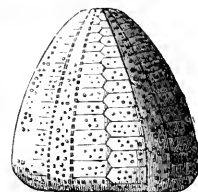


Fig. 146.—*Galerites allogalerus*, a common Cretaceous echinoderm.

riddled by them, just as they are by *Pholas* and other boring molluscs. A pretty little sea-urchin, not quite so big as a threepenny piece, which we find not uncommonly fossilised in the Red Crag beds, is the *Echinocyamus*. In some respects it is a connecting link between the Echini, or sea-urchins, and the "Heart-urchins," or *Spatangi*. The common "Sea-egg" (as fishermen call it), or *Echinus sphaera*, is as old as the Pliocene period, for we have found it in the Coraline Crag beds. The common "Sea-egg" however, is not the type with which we ought to compare the very abundant "Fairy-loaves" (*Ananchytes*) found in the Chalk, and which are so plentiful about Norwich. The mouth and anus of *Ananchytes* are both at the base, whereas in the sea-egg they are relatively at the

base and the summit. In the Ananchytidae must be included the extinct genera, more or less common in the Chalk, of *Holaster*, *Galerites*, &c., in which the basal position of mouth and anus is slightly different. The nearest *living* type of sea-urchin, allied to the Ananchytes, or "Fairy-loaves," was dredged up in the North Atlantic during the "Challenger" expedition, from a depth of nearly three miles, and it is known by the name of *Calymene relicta*. The bottom of the Atlantic is remarkable for the number of creatures living there which are allied to those found in the fossil state in the Chalk formation. The family of sea-urchins called Pourtalesia is of this character, for it is allied to the extinct Ananchytes in many respects. But perhaps the most remarkable living Atlantic sea-urchin is *Salenia varispina*, dredged off Cape St. Vincent at a depth of nearly two miles. A few years ago this genus was believed to have been extinct for ages, for it was not found outside the Chalk, except the *Acrosalenia* of the London Clay, at Sheppey. Now it has turned up in the living state in the Atlantic. It is common in the Chalk near Norwich, and internal flint casts are also found there so abundantly that they go by the popular name of "Pick-cheeses"—"Pick-cheese" being the name given to the ripened seed-vessels of the common Mallow, which the flint casts of *Salenia* very closely resemble. Internal flint casts of Ananchytes, or "Fairy-loaves," are abundant wherever the Upper Chalk crops out, and they are often remarkable for possessing the clearest and most distinct relics, in relief, of the ambulacral pores. *Salenia* are especially numerous in the Greensand beds in the neighbourhood of Warminster, in Wiltshire, one of the pleasantest spots for geologising about that the student could desire.

In the oldest known type of Sea-urchin (*Palæechinus*) the test or shell was composed of more than twenty rows of plates, and the entire test was of a remarkable egg-like shape. Archæocidarids is the oldest known *Cidarids*, or Knobbed Sea-Urchin, and it occurs in the Devonian rocks; but one species (*A. Urvii*) is not uncommon in the Carboniferous Limestone of the Derbyshire Peak district, and we have found its spines somewhat plentifully in the queer little limestone quarry at Hafod, near Corwen, in North Wales. *Palæechinus* seems to occur most plentifully in the Carboniferous Limestone of Ireland. Some beds of the Inferior Oolite literally swarm with fossil *Cidarids* and Cake-urchins. The slabs of Oolitic limestone found in the quarries about Calne may be seen containing a dozen *Cidarids*, many of them with their spines still attached, just as when they were alive. Leckhampton Hill, near Cheltenham (from the summit of which the tourist can obtain a magnificent view of the Severn valley), is composed of rocks belonging to this formation, in which the Cake-urchin *Clypeus* is abundant, as well as various species of *Cidarids*. Hartwell, in

Buckinghamshire, is another good hunting-ground for fossil echinoderms. *Clypeus sinuata* is a fine, large, well-known fossil, well distributed in the Lower Oolitic rocks; it is, perhaps, most abundant in Wiltshire; the Cotswold Hills have numerous outcrops where quarries are opened in their Oolitic rocks, in which *Nucleolites*, *Cidarids*, and *Hemicidarids* are frequently very abundant. These fossil *Cidarids* are very beautiful objects when denuded of their thick, club-shaped spines (fig. 141); the test is seen ornamented with and composed of a series of polygonal plates, each with a large round tubercle in its centre, and a pearl-like setting of a ring of smaller ones around it. Even the club-like spines are frequently beautifully sculptured, and the student can plainly see in their hollow bases how they were attached to the round tubercles, after the mechanical fashion known as a "ball-and-socket joint." The quarries at Calne and Chippenham, in Wiltshire, are especially famous for their abundant yield of fossil *Cidarids*. Various species of *Cidarids* are also found in the Kentish and Norfolk Chalk, either whole or as detached plates; and sometimes we find the impression of one of the latter on a flint, when it presents a very pretty appearance. Solitary club-shaped spines and impressions of the same in flint, are not uncommon in the Chalk formation generally. In the Greensand at Warminster, which crops out from under the escarpment of the Downs, the geological student may find a good assortment of fossil echinoderms, such as *Nucleolites*, *Caratomus*, *Cidarids fusio*, *Goniophorus favosus* and *G. lunulatus*, *Holaster granulosus*, *Micraster lacunosus*, *Salenia clathrata*, *S. geometrica*, *S. ornata*, *S. umbrellæ*, etc. Faringdon, in Berkshire, is another rich Greensand abounding in fossil *Cidarids* where *Salenia petalifera* is especially plentiful. Charlton, near Woolwich, is a good place for Chalk *Cidarids*; and the well-worked pit near the railway station will afford the student good specimens of many other Cretaceous fossils besides, whilst the Tertiary sands overlying the chalk sections are in places rich in peculiar fossils.

The rambler can hardly go into the wrong quarry in the Upper Chalk for Ananchytes, *Micraster*, *Galerites*, etc. They are especially numerous in the large chalk-pits which nearly surround the city of Norwich. The white-surfaced chalk-flints, which lie in heaps in the quarries ready for breaking up into road metal, should be carefully examined—if possible one by one. We have found many "fairy-loaves" and their kind half-imbedded in these hard flints, plainly showing that the latter must have been soft when the fossils were thus buried. Many of these chalk-pits are in lonely localities—just in the very places a man would select for quiet walks, or for their attractive scenery; and, indeed, the tourist finds that the fossiliferous rocks usually crop out where nature is apparelled in her most attractive garb.

(To be continued.)

AIDS TO THE CHOICE OF BOOKS ON BOTANY.*

By BERNARD HOBSON.

AS I have learnt by experience that those who are commencing the study of any important subject are often at a loss to know what are the best books for the purpose, I hope that the following remarks may be of use to such persons, premising that though the prices given are the published ones some of the works are only to be had second-hand.

The best book for beginners (without depreciating other works) and all who wish to obtain a practical knowledge of Botany is the extremely lucid "Lessons in Elementary Botany," by Prof. D. Oliver, F.R.S., F.L.S., 18mo. 4s. 6d.; Macmillan & Co. It contains nearly 200 clear illustrations, the only fault of which is, that they never represent complete plants, but only parts. Typical plants of the chief British natural orders are described, together with the most important exotics, as bamboos, rice, cotton, tobacco, &c., and there is a very good index.

Another good work, excellently illustrated, is the "Vegetable World," by Louis Figuier, 471 illustrations, published by Cassell, Petter, & Galpin, at 7s. 6d. It describes, more or less fully, all the natural orders of plants.

The two following, published by Bradbury & Co., are clearly written and well illustrated. "School Botany and Vegetable Physiology," with descriptions of the chief European natural orders, by Dr. John Lindley, F.R.S., F.L.S.; and "Botany for Beginners," by Dr. M. T. Masters, F.R.S. (with very little on systematic botany). Other similar works are Henfrey's "Rudiments of Botany," foolscap Svo., 3s. 6d., Van Voorst, and "Elements of Botany for Families and Schools," Tenth edition, revised by Thomas Moore, F.L.S., 154 woodcuts, 2s. 6d.; Longmans.

Those who wish for cheaper books may buy "Outlines of Elementary Botany," by G. Bentham, F.R.S., P.L.S., Fourth edition, 12mo., 1s., Lovell Reeve & Co.; a clear summary of facts without a useless word, but no illustrations or descriptions of natural orders. "Primer of Botany," by Sir J. D. Hooker, C.B., P.R.S., 18mo., cloth, 1s., Macmillan, 68 illustrations, but not nearly so complete as Prof. Oliver's "Lessons," and containing next to nothing on systematic botany; Prof. Balfour's "Vegetable Anatomy and Physiology," 1s.; "Systematic and Economic Botany," 1s. (elementary); and two works under the same titles (advanced), 2s. 6d. each; Collins & Sons (illustrated). Prof. J. H. Balfour, M.D., F.R.S. L. & E., is also author of "Elements of Botany," foolscap Svo., cloth, 427 woodcuts, 3s. 6d., and "Outlines of Botany," foolscap Svo., cloth,

nearly 600 woodcuts, 5s.; A. & C. Black, Edinburgh.

More advanced works than any of the foregoing are: Prof. Balfour's "Manual of Botany" (structure, physiology, classification), Fifth edition, 963 woodcuts, crown Svo., 12s. 6d.; also his very complete "Class Book of Botany" (structure, morphology, physiology, classification, geography, fossil botany, glossary), one large volume, Svo., with 1800 illustrations, 21s., (can, or could, be had in two parts), A. & C. Black, Edinburgh.

The splendidly illustrated "General System of Descriptive and Analytical Botany," by Le Maout and Decaisne, translated by Mrs. Hooker, with descriptions of every natural order, and 5500 woodcuts, imp. 8vo., 52s. 6d.; Longmans.

On special branches of botany are: "A Manual of Structural Botany," by M. C. Cooke, M.A., LL.D., twentieth thousand, 200 cuts, 1s.; David Bogue. "The Anatomy and Physiology of the Vegetable Cell," by Mohl, Svo., 7s. 6d.; Van Voorst. "Botany, Structural, and Physiological," by O. W. Thomé, translated by A. W. Bennett, M.A., F.L.S., 600 woodcuts, 6s., Longmans; a text-book which may be considered as introductory to Julius Sachs' "Text-Book of Botany, Morphological and Physiological," translated by Bennett & Dyer, 500 illustrations, 848 pages and index, royal Svo., half-morocco, 31s. 6d., Macmillan; a first-class work for those who wish to go deeply into the subject, and are not afraid of technical terms; it also contains outlines of classification.

"A Manual of Botany, Anatomical and Physiological," by Robert Brown, M.A., F.R.G.S., crown Svo., many illustrations, 12s. 6d.; W. Blackwood & Sons.

"Pollen," by M. P. Edgeworth, several hundred cuts, Svo., 7s. 6d.; David Bogue.

On systematic botany (description of all the natural orders) Dr. Lindley's "Natural System of Botany," with a complete list of genera and synonyms, but no illustrations, cloth, 18s.; Longmans.

Lindley's "Vegetable Kingdom," a large Svo. volume with very numerous and good illustrations and excellent index; a work containing a vast amount of information (price unknown to me).

For those who wish to master the art of description nothing can be better than Dr. Lindley's "Descriptive Botany," 1s., with illustration; Bradbury & Co.

On Cryptogamic Botany one of the best works is Berkeley's "Introduction," 21s.; Baillière & Co.

"Introduction to the Study of Palæontological Botany," demy Svo., illustrated with four plates and 100 woodcuts, by Professor Balfour, 7s. 6d.; A. & C. Black.

Having mastered the principles of botany we proceed to collect British plants and determine their species. All the following contain the flowering plants and ferns only. Sowerby's "English Botany,"

* Any of the books referred to in this article may be obtained from Mr. David Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

in eleven volumes, £22 8s., in cloth £24 12s., half-morocco, £28 3s. 6d., whole morocco, is the greatest work, containing life-size illustrations, beautifully coloured, of every species, with descriptions. It is so costly that few will buy it, but it can be borrowed from any Public Library, and here I cannot do better than advise learners to borrow from a library books they wish to read (not merely keep for reference) one being ashamed to return them unread, whereas if one buys them they are stored up untouched or unfinished.

A rather cheaper work is "The Flowering Plants, Grasses and Ferns of Great Britain," by Anne Pratt, with more than 300 coloured plates, medium 8vo., cloth, gilt edges, £3 13s. 6d., F. Warne & Co.; but for beginners the clearest and best work of the kind is the "Handbook of the British Flora," by Geo. Bentham, F.R.S., P.L.S., in two vols., 8vo., together 1062 pages with illustrations (each about $2\frac{1}{4}$ by $1\frac{1}{2}$ inch) of every species (1295 in all) with 51 pages. Outlines of Botany at the beginning and good index, Lovell Reeve & Co., £3 10s.; now to be obtained at a reduced price. Those who wish for one book only cannot do better than *buy* this, recommended by Professors Oliver and Stanley Jevons, and excellent as a work of reference. With a little patience no one *can* fail to discover the name of a plant by its means.

The most portable "Flora" is Hayward's "Botanist's Pocket-Book" containing botanical and common name, soil, situation, growth and seasons, limp cover, 4s. 6d., no illustrations and very short descriptions; G. Bell & Sons.

More strictly scientific than the two last, and much more complete than "Hayward's," is, Hooker's "Student's Flora of the British Islands," crown 8vo., 10s. 6d.; Macmillan. No illustrations. Owing perhaps to prejudice, it does not seem to me so easy to determine species by its aid as by Bentham's.

Dr. Lindley's "Synopsis of the British Flora," no figures, foolscap 8vo., 6s.; Longmans.

Those who delight in numerous species may buy Prof. Babington's "Manual of British Botany," no illustrations, 12mo., 10s. 6d., Sixth edition, Van Voorst; and lovers of the Linnæan system, Withering's "British Botany," 10s. 6d., 155 figures, Scott, Webster, & Geary—only, I am afraid, to be had secondhand, as no one thinks of teaching the Linnæan system, although easier and perhaps better for this particular purpose only.

Works paying special attention to the uses of plants are "Botany," by Prof. Robert Bentley, F.L.S., with 1138 engravings, 14s., Third edition, J. & A. Churchill, a good manual of Botany in general. Dr. Pereira's "Elements of Materia Medica and Therapeutics," a very celebrated book, 75s., Longmans. Barton & Castle's "British Flora Medica," 1 vol., 8vo., more than 200 figures coloured by hand, revised by J. Jackson, A.L.S., 30s.; Longmans. "Popular Economic Botany," by T. C. Archer,

20 well-coloured and excellent plates, 7s. 6d., Routledge; gives little description of the plants themselves, but can be understood by any one, botanical or not.

On Botanical Geography cheap works are: "Popular Geography of Plants," edited by Dr. Daubeney, 20 plates coloured (but not worth much), 7s. 6d. Routledge & Henfrey's "Vegetation of Europe," foolscap, 8vo. 5s., with map, but no illustrations; Van Voorst.

N.B.—Information respecting any really good works of an inexpensive character which have been omitted above is solicited, in order that they may be mentioned in the concluding part of this paper.

Tahton Elms, Sheffield.

(To be continued.)

MICROSCOPY.

CELLS FOR DRY OBJECTS.—At a recent meeting of the Manchester Science Association a new method of preparing cells for dry microscopic objects was described and illustrated. A ring of shellac having been traced upon the slide, a piece of paper was placed upon it. Having been allowed to dry, the cell was cut out of the paper by means of the turntable and a sharp knife. The rings produced by this method are very narrow, but extremely neat; the writer saw the palate of a mollusc mounted in this way.—*Manchesterian*.

EUGLENA (?) VIRIDIS AND ITS BULBED FLAGELLUM.—It is with pleasure that I supply the information desired by Mr. Robson in last month's SCIENCE-GOSSIP. Every specimen of the Euglena that I have hitherto examined has been furnished with the bulbed flagellum, irrespective of the locality whence it was obtained. Indeed, the fact that Mr. Robson has seen

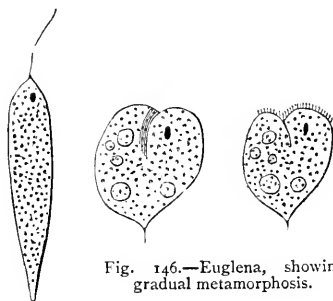


Fig. 146.—Euglena, showing gradual metamorphosis.

them at Newcastle-upon-Tyne, and that I find a quantity of them in the neighbourhood of Preston, seems to indicate that they are not confined to any special locality; at least in so far as the bulbed flagellum is concerned. The Euglenæ, however, are not to be found in every stagnant pond: I examined, recently, samples of water drawn from four different pools without discovering a single Euglena. Your correspondent's theory of the metamorphosis mentioned by

me in my last letter, is certainly ingenious, but is scarcely satisfactory in all points. In my "gathering" the most searching scrutiny failed to reveal the presence of the funnel rotifer in the first instance. Neither was there any other sufficiently large to attack the full-grown *Euglenæ* with which the water teemed. These gradually disappeared until scarcely more than one could be drawn from the vessel containing the water, whilst a whole army of funnel rotifers were sporting away their short life. My suspicion is, at present, that these bulbed *Euglenæ* will ultimately prove to be the larvæ of *Hydratina lutea*, or common funnel rotifer. I enclose a rough pencil sketch of three forms of the *Euglena* observed by me. At the first, No. 1 was the shape of most of those I gathered; these subsequently became fewer, and No. 2 was then the predominating form. A short time afterwards, the flagellum of the No. 2 disappeared, and a wreath of very delicate cilia (No. 3) was clearly discernible. [The objective used by me is a Beck $\frac{1}{4}$ in. with No. 3 eyepiece, giving an enlargement of nearly seven hundred diameters.]—*F. J. S. George, Chorley, Lanc.*

HOW TO MAKE A COMPRESSORIUM.—Cut a couple of pieces of wood the size of a glass slide, with two small arms projecting from the middle on each side,

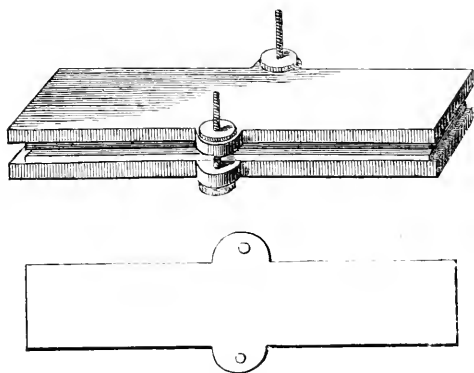


Fig. 147.—Sketch showing details of Compressorium.

with a hole bored through each. Get two screw paper-binders, the largest size : and some glass slides. The object to be compressed is placed between the two glass slides; these are placed between the pieces of wood, and the whole screwed together with the binders which pass through the whole. The only caution needed is to place the holes sufficiently near the edge to admit of the ring of the binder standing out beyond it. Any number of slides, and therefore of objects, can be put in it, and the pressure regulated on either side without moving the object. The outside may be of brass lined with baize.—*H. Field, Blackett, Cambridge Mission, Delhi.*

ZOOLOGY.

BIRDS IN LONDON.—To lovers of nature compelled to spend the best part of the year in London, it is very pleasant to get a glimpse, however occasional, of the birds, and I think their appearance is not so exceptional as might at first be imagined, for during the three years I have been living on and off in London, I have seen as many as twenty-four species. The inevitable house sparrow of course would head the list as regards frequency of occurrence; starlings and rooks are tolerably common; and I have once or twice seen jackdaws. Blackbirds and song thrushes may be seen in all the parks; the missel-thrush is rather rarer; and during the late severe winter I once saw a redwing thrush so busily searching for something eatable on the frost-bound earth that I was able to approach within a couple of yards of it. Of the warbler family I have seen the white-throat-hedgewarbler, the robin, the wren, the willow warbler, and on one occasion the blackcap. The linnet and the chaffinch, the skylark, the pied wagtail, the blue tit, are, as far as I have observed, the only London representatives of their respective families. In Battersea Park a happy little family of moorhens may be seen. I have once or twice noticed the common gull, once, the tern, flying over the river between Vauxhall and Chelsea Bridges, and on one occasion I have seen the great black-backed gull flying slowly down the river, near Lambeth Bridge. Swallows are sometimes to be seen, especially in Battersea Park; twice lately I have seen swifts circling about, on one occasion over the Horse Guards, on the other over the river near Chelsea Bridge. I should be inclined to attribute their appearance to their having had to extend their hunting grounds, on account of insect life being comparatively scarce, by reason of the long-continued unfavourable weather.—*W. H. Legge.*

INFLUENCE OF THE WET SEASON ON BUTTERFLIES.—Not for several years have I observed the summer brood or flight of butterflies (the emergence of which usually occurs about the end of May or the beginning of June) to be so deficient in numbers. The species that have suffered most from the unfavourable spring are those which are single brooded, and confined to a special habitat. In some of these, we may suspect there will be even more scarceness noticeable in 1880, through the deficiency of parents this year. Thus, take such an example as some Fritillary furnishes, say *Argynnis Euphrosyne*. If some wood in which it breeds furnishes in average years a thousand perfect insects, and this year only two or three hundred came out, owing to the death of many larvæ, the number of eggs deposited will perhaps be 25 per cent. less than in 1878. We can easily understand how it is that some species disappear for long periods, or die out, when they had had to endure a succession of unpropitious seasons.—*J. R. S. C.*

THE BRITISH ASSOCIATION meets at Sheffield on Wednesday, August 20, under the presidency of Professor Allman. The contiguity of Sheffield to the Peak district makes that town peculiarly desirable for a meeting of this sort, in which excursions form one of the most attractive part of the week's programme. Among other places to which excursions are appointed are Chatsworth, Thoresby, Darley Dale, Stanton-in-Peak, Arbor Lowe, &c.

THE POPULAR SCIENCE REVIEW.—The July number of this most valuable and ably-edited quarterly is one of the best and strongest we have had for some time. It contains the following articles: "Facts and thoughts about light-emitting animals," by Professor Duncan, F.R.S.; "The life, birth, and death of a storm," by Robert H. Scott, F.R.S.; "On the extinct animals of the Colonies of Great Britain," by Professor Owen, F.R.S.; "Is nest-building an instinct in birds?" by B. T. Lowne, F.L.S.; and "The position of the Silurian, Devonian, and Carboniferous rocks in the London area," by Robert Etheridge, F.R.S.

CAPTURE OF A WHALE IN LOUGH FOYLE.—It may interest some of your readers to hear that early in June a male of the species known as Sibbald's Rorqual (*Balenopectera Sibbaldii*) was captured in this locality. I readily identified it by the description given by Mr. Thomas Southwell, F.Z.S., in SCIENCE-GOSSIP a short time ago. It was injured by coming into collision near the entrance to the lough with a steamer bound for Londonderry. During the day it was observed spouting opposite Moville, and was at once pursued by a large number of people in boats, who by firing, and otherwise frightening it, succeeded in driving it into shallow water, where it was soon left stranded by the receding tide. It was auctioned by order of the Receiver of Wreck, and purchased for £18 by a local gentleman, who has had the blubber removed and boiled down. Its length was about sixty-two feet. Two years ago a grampus in an advanced stage of decomposition was washed ashore at Termone in this neighbourhood.—*John Anderson, Moville.*

OCCURRENCE OF *LOPHINUS PALMATUS* NEAR EASTBOURNE.—I recently found four males and two females of this species near here, and as Sussex is not mentioned as a habitat by Cooke in his "British Reptiles," I thought it might interest other readers of SCIENCE-GOSSIP to know that they do occur here. I may add that I do not find them as hardy as the other British newts, both of which are also to be found in this neighbourhood.—*Charles Foran.*

THE MANATEE.—At a recent meeting of the Zoological Society, Dr. J. Murie read a paper on the Manatee, containing the results of his examination of the specimen which was lately living in the Westminster Aquarium. The peculiar attitudes assumed

by the animal in life, the great mobility of the upper lip, and the occasional use of the limbs in feeding were noted. As regards the anatomy, the chief points dwelt on were the shape of the brain and its suppressed convolutions. The vexed question of the number of the cervical nerves and their distribution was also discussed.

THE NIGHTINGALE.—It would be interesting to receive well-verified notes on the latest date up to which (perhaps on account of the delayed summer) the nightingale's song has been heard this year. I heard the bird in full song about four o'clock on the afternoon of July 2nd—the latest date I remember to have heard of.—*J. E. Taylor.*

BOTANY.

ABNORMAL DEVELOPMENT OF *CARDAMINE PRATENSIS*.—In the chapter on Heterotaxy of Dr. Masters' work on "Vegetable Teratology," is an account of an abnormal development in *Cardamine pratensis* quoted from Bromfield's "Flora Vectensis." A form of *Cardamine pratensis*, somewhat similar to that described, has been growing in a field in the parish of Widford near Chelmsford for many years. It was first observed by me in 1859, and is to be found there to this day; which seems to prove that, monstrous as it is, it may be regarded as a permanent variety. The flower opens first like any other of the same species, sepals, petals, and stamens occupying their proper places and falling as in cruciferous plants they commonly do. Then the ovary acquires a stalk and swells into a flower-bud, which finally opens into a second flower that is perfectly double, like that of a double stock or wallflower. When transplanted into a garden, the plant retains its character and may be readily propagated by division, so that if it gain favour with botanists or amateur gardeners it may become as common as anybody could wish it to be.—*John Gibbs.*

FLY-CATCHING PLANTS.—My attention has been directed to an interesting passage in which the carnivorous properties of the *Drosera* (sun-dew) are affirmed, though I believe the discovery that the plant not only catches, but digests, and is nourished by insects, is also, and mainly, due to the independent researches of Dr. Darwin. The passage occurs in a note on p. 13 of a small book entitled "Arran; a poem in six Cantos." By the Rev. David Landsborough, Minister of Stevenston, Ayrshire (Edinburgh, W. Blackwood, 1828). The author writes:

"Should a fly
Rashly presume to sip the sparkling dew,
Or leaflet fresh to crop, she dies the death.
The viscous dew soon clogs her wings and feet;
And soon her mouldering form strengthens the plant,
Which thus, when persecuted, better thrives."

To this the following note is appended: "What I have said respecting the sun-dew being nourished

by the dead bodies of the flies which it entangles, *is a theory of my own*, in so far as it relates to the sun-dew, but I have little doubt that it is a correct one." He adds that Sir J. E. Smith was aware that the American plant *Dionca muscipula* is "to a certain extent nourished by the insects which it catches." The "viscous dew" of the *Drosera* is simply vegetable pepsine. The author made one curious mistake respecting it, that he supposed its purpose was "to prevent small insects from infesting the leaves." It is more likely that they are attracted by it, as the aphid is by the "honey-dew" on the leaves of the lime-tree. One of the best examples of a fly-trap is furnished by *Arum maculatum*. If the spathe is cut open, the ball at the lower part will generally be found full of flies. They creep in, attracted by the strong scent of the spadix, and are prevented from returning by the fringe of deflexed hairs which fill the constricted part, or neck of the spathe.—*F. A. Paly.*

CARDAMINE AND MATTHIOLA.—It may interest your readers to hear that a quantity of the common cuckoo flower (*Cardamine pratensis*) has been found growing double near Chichester, in a paddock adjoining Mundham House, the residence of Mr. Hillier, who has kindly forwarded me several fine plants, a specimen of which I enclose. When staying near Freshwater a week or two ago, I gathered some enormous specimens of *Orchis morio* near the fort at Colwell Bay; some of the flowers are deep purple, others salmon colour, some pure white, destitute of spots; the flowers were so thickly crowded together all round the stem, that I had to pick many off before I could succeed in drying a specimen. Dr. Bromfield, in his "Flora Vectensis," states that the *Morio* is scentless; these were, however, very fragrant, in fact, so overpowering was the scent I had to turn them out of my room. I may also add that the cliffs from Freshwater Gate to Compton Bay, a distance of about two miles, abounded with remarkably fine plants of *Matthiola incana*—most of which, however, were growing in inaccessible places. The flowers were much darker and smaller than those I gathered last year at Ventnor, and the plants much more bushy. As Freshwater is supposed to be its only *bona fide* habitat in a wild state, it is satisfactory to know that there is thus no danger of its being extirpated.—*F. A. Brent, Pellhurst Villa, Ryde.*

MONSTROSITY OF *GEUM RIVALE*.—Allow me to draw attention to a monstrosity of *Geum rivale*. The plant grew by the side of a brook. It was about eighteen inches high, with several flowers, each having the following peculiarities, more or less developed according to the æstivation of each flower. Instead of drooping (as is usually the case), each flower stood erect; the calyx consisted of five unequal sepals, having all the appearance of true leaves, with five minute brown sepals alternating with the larger ones.

Of the corolla nothing can be said, only that it was double, each petal being of the usual form and colour. The stamens were much less in number than in an ordinary specimen. The carpels formed the usual globular head, but instead of being on the same level as the stamens, were borne on an elongation of the pedicel, which passed through the centre of the flower, so that they were situated fully two inches above the other parts. At their base were five lanceolate green bracts.—*J. T. C. Williams.*

SCIENCE-GOSSIP BOTANICAL EXCHANGE CLUB.—We are glad to be able to inform our members that we have a large parcel of excellently-dried specimens of British Rubi, all localised, and best of all, they are all trustworthy examples of this intricate genus. We hope this valuable gift will bring us many more members; a parcel will also be sent to those who, although unable to contribute specimens for the year's distribution, send the London Catalogue with the nominal subscription.

SHOWER OF POLLEN.—Being at Windsor on Sunday, June 8, my attention was taken by a yellowish scum floating on the surface of the puddles during a sharp shower about 6 P.M. On putting it under the microscope it turns out to be pollen of some kind: see sketch at three hundred diameters. Is it the



Fig. 148.—Magnified pollen-grains which fell in the "Pollen-shower."

Pinus australis mentioned by your correspondent in p. 138? The fall was pretty general, having been noticed at Eton, Slough, and Frogmore; has any one else noticed it?—*H. G. Wheeler.*

VEGETABLE "COMMENSALISM."—I wonder whether botanists will ultimately discover that certain plants are "commensal," as well as certain animals such as Professor van Beneden has told us of in his "Animal Messmates." For several years past, I have been particularly struck by the occurrence in the eastern counties of the Yellow-wort (*Chlora perfoliata*) so constantly in company with the Bee-orchis (*Ophrys apifera*), that when I have found one plant I have almost instinctively looked for the other. Has this association been noted elsewhere? It seems possible to imagine that flowers generally obscure should reap some advantage by growing in the neighbourhood of more attractive

kinds (although the bright yellow-wort hardly needs to associate with the Bee-orchis on that account), just as you see little confectioners' booths springing up by the side of some itinerant circus, in order to profit by the greater attraction of the noisy exhibition. Again, I conceive it possible that other flowers may be advantaged in quite a different way, by growing in company with plants possessing some poisonous stinging,* or other defensive property. Thus, it is noticeable how certain kinds of umbelliferous flowers are always found growing in the midst of dense patches of nettles, or amid the thorny brambles and hedge-rows. Have any of our botanical readers noticed anything approaching such a "commensalism" as is here suggested?—*J. E. Taylor.*

GEOLOGY.

FURTHER DISCOVERIES IN THE CRESSWELL CAVES.—Professor Boyd Dawkins and the Rev. J. M. Mello, F.G.S., have communicated to the Geological Society an account of digging-operations carried on in one of the smaller caves of the Cresswell Crag, known as Mother Grundy's Parlour. They described the occurrence in the red clay and ferruginous sand of this cave of bones of hippopotamus and the Leptorhine Rhinoceros, proving the existence of these animals in the wooded valleys of the basin of the Upper Trent at the time of the accumulation of those deposits; while at the same time, so far as the evidence goes, there was an absence of Palæolithic man, of the reindeer, and of horses, while hyænas were abundant. In a subsequent period, represented in all the caves by the red sand, the mammoth, woolly rhinoceros, the horse, and reindeer inhabited the vicinity, and were subject to the attacks both of hyænas and of human hunters, whose quartzite implements prove them to belong to the same people whose traces are found in the river-deposits. In the breccia and upper cave-earth of the larger caves the existence of the Palæolithic hunter is evidenced by flint implements, resembling those of Solutré, accompanied by implements of bone and antler. Associated with these was the incised figure of a horse described in a former paper. The authors finally dwelt briefly upon the characteristics of the caves in prehistoric and historic times, and indicated some of the anthropological points of interest connected therewith.

DR. GWYN JEFFREYS has communicated to the Zoological Society the second part of his work on the Mollusca of the *Lightning* and *Porcupine* expeditions, embracing the families from Anomiidæ to Arcidæ. The number of species noticed was 100, of which 4 were new to science, and 15 were hitherto unfigured. Particulars were given of the geographical and geological distribution of all the species, and their synonymy was discussed. Some species of *Leda* and *Malletia* were Sicilian fossils of the Pliocene formation, and had

not been previously known as recent or living. These species occurred at great depths, a fact which showed that the sea-bed in that part of the Mediterranean had been considerably raised since the Tertiary epoch.

FAULTS IN THE LONDON CLAY.—Dr. J. E. Taylor has forwarded to the "Geological Magazine" an account of nine faults or dislocations seen in the newly-made sections of the London clay near Harwich, which have been laid bare by the excavations for the construction of the new docks. These "faults" are as plainly visible as in a geological diagram, and the most important of them indicated a vertical dislocation of more than twelve feet. With one exception, the faults dipped at an angle of about fifty degrees.

A MAMMALIFEROUS DEPOSIT AT BARRINGTON, NEAR CAMBRIDGE.—The Rev. O. Fisher, F.G.S., has just communicated a note to the Geological Society on this subject. The gravel in which the remains were found is about twenty feet above the alluvial flat by the river Rhee, and is evidently post-glacial. The gravel contains some of the ordinary land and fresh-water shells, but not *Cyrena* or *Unio*. Remains of the following mammalia have been found: *Ursus spelæus*, *Meles taxus*, *Hyæna spelæa*, *Felis spelæa*, *Cervus megaceros*, *claphus*, and another, *Bos primigenius*, *Bison priscus*, *Hippopotamus major*, *Rhinoceros leptorhinus*, *Elephas antiquus* and *primigenius*, with a worked flint, almost certainly from the same deposit. Mr. Fisher considers the abundance and admixture of these remains due to the locality having been a sort of eddy or pool in the old river.

VIVIPAROUS ICHTHYOSAURIA.—At the last meeting of the Geological Society, a paper on the evidence that certain species of *Ichthyosaurus* were viviparous was read by Professor Seeley. The author described certain specimens of Ichthyosaurs in which the remains of one or more small individuals have been preserved within the body-cavity of larger ones. One was noticed in 1846 by Dr. Channing-Pearce, who suggested that it furnished evidence in favour of the viviparity of the Ichthyosaurs. Other examples are preserved in museums in Germany, and one in Madrid, and most of them have been examined by the author, who adduces the state of preservation of the small individuals, in contrast with that of the traces of fish and Cephalopoda, the remains of food, which are found in the stomachal region of the larger individuals, in advance of the position occupied by the smaller ones, as a proof that we have not here to do with a case of cannibalism. The position of the smaller skeletons, with the head generally turned towards the pelvic region of the larger ones, is also regarded as indicative of their standing in the relation of parent and offspring. As some of the young specimens possess limbs, it would seem that the supposition that *Ichthyosaurus* passed through a sort of tadpole stage is erroneous.

SAMUEL WOODWARD, THE NORFOLK GEOLOGIST.—In these days, when it has become fashionable to glorify naturalists in humble life, we are glad to see that Mr. H. B. Woodward has contributed to the Norfolk and Norwich Naturalists' Society a "Memoir of Samuel Woodward." This veteran geologist and antiquary, who so enthusiastically worked at the geology of Norfolk fifty years ago, when there were plenty of suspicions and social persecutions prepared for those who dared to follow the "stony science," was the honoured father of "the Woodwards," who have done so much for palæontology, and the grandfather of the writer of this capital and much required memoir, himself a young geologist, who has already "won his spurs."

THE GEOLOGICAL SURVEY AND ITS RELATIONS TO AGRICULTURE.—We are glad to see that Mr. F. J. Bennett, F.G.S., has reprinted the address on the above subject, recently delivered before the Ixworth Farmers' Club, in the pamphlet form. It is a well-considered essay, and should be read by all those interested in agriculture.

FOSSILS AT FOLKESTONE.—While spending a short holiday at Folkestone, I enjoyed a very pleasant time in searching for fossils in the gault, and found the following specimens very abundant:—*Ammonites tuberculatus*, *A. splendens*, *Inoceramus sulcatus*, *I. concentricus*, *Hamites*, *Nucula pectinata*, *Belemnites Listera*, *Rostellaria*, and many other rare but at present unnamed specimens. I write this to encourage any fond of collecting fossils to give Folkestone a trial. There is a small local museum and a capital free reading-room. On the Warren may be found many rare species of plants, and in the chalk there are also many interesting objects for the microscopist.—*E. E.*

LOCALITIES FOR FOSSIL STARFISH.—Permit me to add a note to the reference to Leintwardine in your article (No. VII) on "Common British Fossils." *Imprimis*, that village is nine (not six) miles from Ludlow. The only locality where the starfish have been found was a quarry on the top of Church Hill; but the stratum, or band, in which they occurred was very thin; about 9 inches, if I remember rightly; and it has been worked out as far as it could, without encroaching on the fields. There is a large quarry on Mocktree Hill, where the Lower Ludlow beds join the Aymestry limestone, but only a small trace of the starfish band has been found there.—*E. B. Kemp Welch.*

LOCALITIES FOR FOSSIL STARFISH.—As you have invited your geological correspondents to inform you of localities where fossil starfish have been found, I have much pleasure in placing upon record a quarry at Rumney, about two miles from Cardiff, as a locality where I have been fortunate enough to discover one

of *Paleaster*. The fossil is well preserved in a fine grained yellowish sandstone belonging to the Upper Silurian. I have only found this one specimen, nor have I heard of other searchers being so fortunate as myself, but I have no doubt careful searching would be rewarded.—*W. H. Harris.*

LOCALITIES FOR FOSSIL STARFISH, &c.—In your last article on "Common British Fossils," &c., (one of a series which I am very glad to see recommenced, and which I have read with much interest) you ask for information concerning "any fossil starfish locality." In the upper greensand beds of Blackdown, in my immediate neighbourhood, starfish have been found. Two such specimens are to be seen in the Bristol Museum. They are, I think, unnamed, but they are in good preservation. The matrix in each case is a half prepared whetstone, for which article the Blackdown beds have been extensively quarried. The workmen tell me of several such finds, which they have sold to private collectors. They describe them as being "like a cart-wheel," a description not accurate enough to warrant me in saying whether they belong to the asteroid or ophiuroid order, though those in the Bristol Museum, unless my memory greatly misleads me, belong to the former. Starfish are by no means common in the Blackdown beds, nor have I ever myself found them there.—*W. Downes.*

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—Mr. A. C. Rogers has retorted on me that my remarks on this subject in your May number are more poetical than scientific. I admit this, and my excuse is simply that I considered the scientific part of this good-natured "gossip" was safe in the hands of himself and Messrs. Barclay, Wheatley, and Co., but thought the impressions the correspondence had given to an outsider, and a reminder of what some intellectual (though I admit unscientific) minds had thought on the subject, would not be out of place. Will you kindly allow me now to mention what seems to me difficult to understand in Mr. Wheatley's last letter. He points out that monkeys, among other wonderful things, listen to speeches from their leaders, and attributes the reasoning power of man in part to language. How is it that with this power of speech in monkeys, added to all their wonderful primal impulses (which Mr. Barclay mentions, and which cannot be denied, and which enable them to act so reasonably according to the necessities of their existence) they have not, and apparently never will formulate the first rudiments of the science of language; and if they have a language sufficient to "speechify" for a long time, how do they get it without having in some way formulated it; except, as Mr. Barclay says, from primal impulse? It appears to me that the difference in monkeys and men cannot in this respect be attributed to the many thousands of years Mr. Wheatley speaks of, in which man had the opportunity of developing his powers, for I have yet to learn that man appeared on the scene before

monkeys. We are told that monkeys occasionally "execute careless sentinels," thus (if we judge of them by comparison with our own thoughts and motives) they have a conception of retributive justice; the carrying out of conception denotes contemplation, mental conception and contemplation denotes mind—but as Mr. Barclay (I think) has put it, are we sure we are safe in so judging? Let it be proved that a monkey's idea of capital punishment comes from the same kind of reasoning as that of man, that it is acquired in the same manner, then I can believe that monkeys have mind; but let it be proved (and the thing seems to me to be self-evident) that it is not so acquired, and that probably it comes from the pure instinct of revenge, then I can only believe that however "reasonable" the actions may appear, they are the result of primal impulse. Mr. Rogers says he cannot see how memory can exist without reason, nor reason without memory. Is not the difficulty rather how *instinct* can possibly exist without memory, its necessary incident? What would be the use of an instinct of locality unless an animal remembered the particular locality its instinct prompted it to find? What would be the use of its instinct of appetite without the memory to know where it had found food and thence where to look for it? What would be the use of the instinct to avoid pain unless the animal remembered what gave it pain? What would be the use of the instinct of the dog to become attached to its master unless through the instinct of scent or otherwise it remembered its master, and so on in all cases of instinct? Without memory in these cases the instinct could not and would not exist. It may be said so it is with mind; without memory that would have no existence, but it by no means makes the two faculties (mind and instinct) alike. The difference seems to me to consist in this, man is able to remember and to think, and from *thought* to act independently of primal impulse. Animals are able to remember, and from *memory* to act in accordance with some given primal impulse. The one constitutes mind, the other instinct. So far as either faculty depends upon memory for its development or completion, it differs only in degree from the other. So far as the one does not depend, and the other does depend for its development or completion upon primal impulse, they differ in kind, the one stamping the creature as an intellectual, the other an unintellectual being—at least, such is my idea.—*Idea*.

INTELLIGENCE IN MAN AND ANIMALS.—The little discussion on the above subject, now appearing in SCIENCE-GOSSIP, is in danger of becoming confused, unless the several disputants at once define clearly and precisely what they mean by the terms "instinct" and "reason." Exact definitions are at all times valuable; but in the present instance they are absolutely necessary, to show the points of agreement and of difference subsisting between the parties to the discussion. How far is an "instinctive" act automatic, and how far is it the outcome of volition? I have long held the opinion, that what is termed instinct, is identical in essence with what we call reason; and that this peculiar "faculty" is possessed, in some degree, by all animal organisms at least. Whether any sections of the vegetable kingdom are similarly endowed, I do not pretend to say; but certainly, the actions of some of them are remarkable. I shall watch the progress of the discussion with great interest.—*F. James George*.

INTELLIGENCE IN MAN AND ANIMALS.—There were two or three misprints in my letter of June, which, as they alter the sense, I should be greatly

obliged if you would grant me a line to correct. They are as follows: For "concise proposition," read "converse proposition." For "law of reason," read "supposed law of reversion."—*H. D. Barclay*.

DEVOTION OF A DOG TO A CAT.—When staying near Lausanne this spring, I met some Swiss friends of my host's, who told us a remarkable instance of attachment on the part of their Saint Bernard dog to a kitten. Their next door neighbours threw some newly-born kittens over the garden wall that the dog might make away with them. He caught and bit one kitten as intended, and one was killed by the fall. Bernard now seems to have undergone a revulsion of feeling, for the two remaining kittens became the objects of his attention and care. Carrying them off in his mouth to his kennel he tried to revive them by licking and warming them. One soon died, but the other responded to the care bestowed on it by its huge nurse, which was supplemented by the kindness and feeding of Bernard's owners. It throve in its kennel home, where the pair were constantly to be seen together, the soft little black cat lying cuddled in Bernard's protecting arm, whence its bright eyes peeped out at passers-by. Pussy returned the dog's good-nature by the devotions of a daughter, and when in the course of time she became the proud mother of a family, she was impatient to introduce her kittens and adopted father. Mewing and skipping before him she conducted Bernard from his kennel to her cosy nest, rolling over and over with delight on the grass near, while he solemnly inspected his favourite's family; thus showing the strongest proof possible in an animal of confidence and affection, and one certainly at variance with the instincts usual in cats towards dogs. The regard which existed between the two friends lasted through life; what is very remarkable is that Monsieur Gaulis says Bernard, ever after his adoption of the kittens, showed the greatest disinclination to hunt any black cat.—*D. Hoskyns*.

SHREW MICE (*Sorex araneus*).—Rambling in June last on the Welsh hills, on and around a block of millstone grit rock, I noticed the remains of a great number of shrew mice. The rock was situated at the top of a mountain, the highest ground in the district. The remains consisted of the heads and hinder quarters of at least thirty animals all in various states of decay. The heads appeared to have been severed from the body very much in the same place; indeed, so much so that one might almost have imagined the bodies to have been placed in a line and then to have had their heads cut off with a knife. The hind quarters were also severed precisely in the same manner above the hind legs. I also noticed that the livers had also been carefully rejected, and a few, quite fresh, were still sticking to the rock. I concluded the shrews must have been brought there by some bird of prey. Taking into consideration the fact of the rock being lofty and more or less isolated, I thought the bird might possibly have been a kestrel (*Falco peregrinus*). Being unable, however, to find the remains of birds or other animals, I was led to suppose it might be an owl. Can any of your readers inform me if either of these birds or any others are in the habit of choosing one particular spot whereon to eat their food? And also as to their having eaten it so daintily?—*A. A.*

HOW TO DESTROY BEETLES.—Can any of your readers inform me the best plan to get rid of the *Otiorynchus sulcatus* (or *Picipes*), which does great damage to raspberry plants?—*W. Roberts, 9 Chapel Street, Penance*.

STURGEON AT MAIDSTONE.—I saw a splendid royal sturgeon shot to-day while endeavouring to pass over the locks here. I suppose it came up during the floods we have had lately. The fish was shot by Messrs. Whiteman and Russell, and measured 7 ft. 9 in. in length, weighing 148 lb. It is a very unusual occurrence here.—*R. F. Osborne.*

BIRDS AND FRUIT.—Mr. G. J. Lowe, of the Highfield House Observatory, says: "No birds or birds' nests have been destroyed here for many years, and yet we have fruit. No doubt the birds help themselves (as wages), but without their labours there would be no fruit for anyone. Several times birds have saved me a crop of apples. On one occasion an examination of hundreds of bunches of blooms disclosed caterpillars feeding in every bunch; next day the birds had found them, and in a few hours there was not a caterpillar to be seen. A grass field here was so infested with the grub of the cockchafer, that the grass could be rolled up; soon the birds began their work, and the grubs vanished. Some years ago the farmers killed all the rooks in a particular district, and the crops in consequence were destroyed by grubs, and it was only on the reintroduction of these birds (at a great cost to the farmers) that good crops were again obtained. Thirty-five years ago a nurseryman left here for Australia, taking with him all our popular hardy fruits and vegetables, but the produce was yearly destroyed until the English sparrow was introduced, after which there was plenty of fruit."

Waterton calculated that a single pair of sparrows destroyed as many grubs in one day as would have eaten up half an acre of corn in a week, and that instead of giving a reward of sixpence a dozen for dead sparrows, more would have been gained by paying many times as much to preserve them from injury.

PIKE TAKING TENCH.—I am afraid that Mr. John H. Keene's assertion that the pike, be he ever so hungry, never takes a tench *is*, as he says, "too pretty to be true." On June 4th, fishing in a canal reservoir in Shropshire, I caught a jack of ten pounds' weight with a small tench as a bait. The exact spot where this fish was taken had the same day been trolled over by a friend and myself, using respectively a gudgeon, and a perch. We may therefore reasonably presume that "*Esox*" prefers a tench as a dainty morsel to either of these fishes. Moreover, my friend, than whom a more successful angler for pike does not exist, tells me that he prefers a tench as a bait for pike to almost any other kind of fish.—*W. B. N., Asefield.*

INSECT-BLIGHTS.—Will you allow me to make inquiry through your columns as to the title of any book or books which will give some general information on the very interesting subject of insect-blight, aphides, or plant-lice? I have the "Letters of Rusticus," which little volume, so far as it goes, is admirable: but what Mr. Newman has done for the gooseberry-grub, the hop-fly, and the turnip-fly, I do not doubt has been done by some author (if I only knew his name) for the innumerable species of fly or aphids, which in some form or other, infests (I believe) almost every plant. I think that some such inquiry as this was made a year or two back in the pages of SCIENCE-GOSSIP, by some other correspondent, but elicited no reply. I trust, however, that I may be more fortunate, and shall be truly grateful if any of your Entomological readers will help to enlighten my ignorance on this interesting subject, by guiding me to the right channel for information.—*Alfred Charles Smith, Yatesbury Rectory, Calne.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

CAREX (Fishbourne).—There cannot be any doubt about its being *C. panicea* (L.). The list for Exchange Club stands as last year. We should imagine the three *Carexes* could still be gathered; two at least have been recorded recently in Ireland.

G. C. (Highfield).—They are too young to decide with certainty; we believe they are 1. *Carex panicea*; 2. *C. stricta*; 3. *C. ampullacea*; 4. *C. muricata*; 5. *C. ovalis*; 6. *C. cultrata*. Could you let us see more advanced specimens?

C. E. S. (Jersey).—They are 1. *Asplenium lineolatum*; 2. The same (we think), but a small stunted frond.

W. J. X. (Ely).—The examples of *Batrachium ranunculii* are, Nos. 1 and 2 *R. trichophyllum* (Chaix); 3. *R. heterophyllum*; 4. *R. heterophyllum*; a variety approaching *R. floribundum*, (Bab.).

B. L. B. S. (Bolton).—We could not tell from a single leaf: no doubt flowers will soon be seen, then let us see it.

! O'MEARA (St. Omer).—Thanks for your kind letter; the specimen enclosed was a variety of beech, named in nursery catalogues *Fagus sylvatica laciniata*; the upper part is probably growing out. You will find it explained in "Trees of Old England," by Grindon.

F. L. S.—The beetles are *Ptinus fur*, allied to the Death-watch beetle, and very common in houses.

G. P. JOHNSON.—The insect attacking the wine corks is not a beetle but a small moth, *Enophila v-flava*. The larvae are in the corks in May and June. Thoroughly dipping in hot wax, so that the coating reaches the glass, leaving no room for the female moth to get at the substance of the cork to lay her eggs in, would be effectual.

S. J. L'ANSON.—We duly received your very beautiful sketch of *Calla Ethiopica*, showing double spathe. It is a phenomenon of frequent occurrence among the *Araceae*. Dr. Masters has shown that the presence of an increased number of spathes in *Calla palustris* is associated with the development of a side shoot from the axil of the last leaf, where no shoots usually issue. Your specimen is remarkable for having both spathes on the same level, and evidently of the same size.

B. H.—The Devon and Cornish coasts, and the shores of the Isle of Man, are the best places we know of for collecting coloured sea-weeds. The neighbourhood of Douglas, Isle of Man, is perhaps unequalled in the British Isles.

T. MEARE (Burnley).—Add some used tea-leaves to the soil where your oak-leaved geranium is growing. We do not think the buds will then wither away as you describe.

Z.—As far as we can judge from your outline sketch, the creature is the aquatic larva of a dipterous insect (allied to the crane-flies, or "Daddy Longlegs") called *Ceratix plumicornis*.

E. VILES.—The alga found on the carriage drive is *Lyngbya muralis* (Ag.), usually found on the ground in early spring, in all damp situations.

J. W. HARVEY.—Please inform us of the locality and habitat of the sponge you sent to be named last January.

A. SCHREIBER.—We cannot undertake to name sponges from such small portions as those you sent us. The last specimen sent was evidently a species of *Chalonis*.

C. PARKINSON (Ventnor).—The "monstrosity" in the species of *Ranunculus* sent us is due to "fasciation," one of the commonest of vegetable malformations. It is usually met with when an unusual number of buds are formed in close apposition, when they are liable to be compressed during their growth, so that union takes place among the soft tissues.

H. HEINES.—The "monstrous" condition of the specimen of the water-avens (*Geum rivale*) you kindly sent us, was due to medial floral proliferation. It is of most common occurrence among pinks. See Masters' "Teratology," p. 119. Could you send us a few more flowers and leaves of the sapindaceous plant you enquired the name of? Many thanks for the interesting malformed specimens of *Arum maculatum*.

R. J. WARD (Lincoln).—Your specimen of *Calceolaria*, showing the three different kinds of malformation of flower, are very interesting.

ROBERT M. CHRISTY.—1. The grub is the caterpillar of a

small moth, *Retinita Buoliana*, one of the family *Tortricidae*, common wherever pine-trees grow. There are particulars in London's translation of Kollar's "Treatise on Injurious Insects;" and a paper by Westwood on the allied species, *R. turionana*, of similar habits, in the "Gardener's Chronicle" for 1850, No. 44, would also be of interest. Nothing short of cutting off and burning the infected shoots while the grub is in them, could be of any use. 2. As to getting rid of Goat-moths. Picking the larvae by hand would be easy, as they are so large; it would do little harm to cut away the outer wall of their galleries, if not too deep. Injecting the carbolic acid with a strong syringe would certainly bring them out.

E. DUPREY.—The "dark purple mineral in small veins of syenite" is the violet-coloured variety of fluor spar, which in Derbyshire is found in large nodular masses, and locally denominated "Blue John."

H. D.—Your fungi were so withered and dry when they reached us, though not being properly packed, that it was utterly impossible to make them out.

R. A. BULLEN.—The banana (*Musa sapientum*) belongs to the order Musaceae. "Brazilian tea" is composed of the leaves of *Stachytarpheta jamaicensis*, a member of the Verbenaceae.

W. H. L.—Your specimens are (1) one of the lime-secreting sea-weeds (*Corallina officinalis*); (2) a Bryozoan (*Membranipora pilosa*). The form of "cup-moss" (*C. plicatula*) you mention is not uncommon. Try a little benzine for removing the mould.

C. H. GASTREL.—Thanks for your interesting specimen.

J. A.—We will see to the insects being named in due course. The best book is Rye's "British Beetles," published by L. Reeve & Co., price 10s. 6d.

E. W. A.—Get Lindsay's "British Lichens." There is a work now issuing on "American Characeae," but we are not aware of any special work on British species.

T. S. SMITHSON.—Your plant is the white variety of the common milk-wort (*Polygala vulgaris*). Lindley & Hutton's "Fossil Flora" contains the best figures of coal plants. The chapter on "Coal" in the work just published by Macmillan on that subject, will give you a capital account of the structures and affinities of coal plants.

H. PEARCE.—Botanical mounting paper may be obtained of J. Gardner, 426 Oxford Street. Did you see the advertisement notice of the "Botanist's Portable Collecting Press" in last number of SCIENCE-GOSSIP?

J. A. WHELDON.—Your mosses are: 1. *Polytrichum juniperinum*; 2. *Hyponum cuspidatum*; 3. *Hyponum rutabulum*; 4. *Funaria hygrometrica*; 5. *Leptobryum pyriforme*.

A. P.—Your moss is *Campylopus turficus*.
W. E. GREEN.—The mosses sent in are as follows: 1. *Bryum pallens*; 2. *Trichostomum flavo-virens*; 3. *Dichodontium pellucidum*; *Bryum* (young, probably nutans); 5. *Hyponum confertum*; 6. *H. cupressiforme*, var. *resupinatum*.—R. B.

M. MEDHURST.—The specimens belong to a species of water-mite (*Acarina*), but they are in too fragmentary a state to tell which species. Could you send us a clean mounted specimen?

EXCHANGES.

For leaf of *Eleagnus Japonicus variegata* send other unmounted material; some duplicate slides to exchange.—The Lindens, New Brompton, Kent.

A COLLECTOR, who has some duplicates, will send twenty specimens of rocks and minerals on receipt of fourteen pence; carriage paid to Manchester. Apply to E. Jones, Poplar Grove, Sale, near Manchester.

PREPARED tubes and packets of very interesting material, mostly marine, on approval; exchange in good slides, photo lens, camera telescope, books, &c.—T. McGann, Burren, Ireland.

EGGS of bird parasites, a set of about twenty different kinds, to include those figured in SCIENCE-GOSSIP of June 1, 1870, required in exchange for purely Indian slides, mounted or for unmounted material.—C. Liddell, "Englishman" Office, Calcutta.

WANTED, the following medals:—1st Burmese medal, Cabul, Candahar, distinguished conduct, Hyderabad, Jellalabad (crown), Jellalabad (victory), Chuznee—Cabul, Meanee, Hyderabad, meritorious service, Meanee, Penniar Star, Serinagapatam, Victoria Cross. Fossils, minerals, British or foreign shells, or money for the same; state price, to A. J. R. Slater, Bank Street, Teignmouth.

WANTED, a few fine specimens of crystallised minerals and ores. Offered upwards of a hundred species of British marine shells, from Jersey; some very rare. Lists exchanged.—E. Duprey, Jersey.

SEVEN-GUINEA electric machine for fossils, micro slides, or books on natural history.—W. Tylar, 165 Well Street, Birmingham.

WELL-FINISHED slides offered of *Batrachospermum moniliforme*, *Scytomena myochrous*, *Volvox globator*, *Coleochaete scutata*, various micro-fungi, wood sections, &c., in exchange for the following materials:—cleaned Polycistina, cleaned and named diatoms, or micro-photographs of any kind.—William West, 15 Horton Lane, Bradford.

WANTED, twelve typical specimens, each of Nos. 128 and 145

L. C. 7th ed., in exchange for an equal number of any of the following:—183, 206, 560, 634, 858, 1109, 1383, 1387, 1418, 1462, 1535, 1537, 1538, 1556, 1639, 1640, 1641, 1657, 1661, and 1667. William West, 15 Horton Lane, Bradford.

TRANSPARENT sections from the coal formation showing macrospores, microspores, and other fossil vegetable tissues, in exchange for well-mounted recent vegetable tissues, sections of leaves stained or otherwise.—John Butterworth, Goats, Shaw, near Oldham.

Will exchange slides of fossil fish remains, for good pocket lens, section cutter, frog plate, live cage; correspondents invited.—Joseph Taylor, Shire Moor, via Earsdon, Newcastle-upon-Tyne.

WANTED to purchase second-hand copies of vols. vi. and vii. of SCIENCE-GOSSIP, bound or unbound.—H. Crowther, The Museum, Leeds.

I SHALL be glad to receive lists of foreign Unios from any one having them for sale or exchange.—G. Sherriff Tye, 62 Villa Road, Handsworth, Birmingham.

WANTED to complete SCIENCE-GOSSIP volumes for 1874, 1875, 1876, and 1877. Will give cash or state wants.—T. F. U., 233 Upper Brook Street, Chorlton-on-Medlock, Manchester.

Pupa ringens for good British shells.—Rev. W. C. Hey, Clifton, York.

DUPLICATES of the undernamed good British land and freshwater shells, offered in exchange for numerous desiderata—*Limnaea Burnetti*—same, var. *lacustris* (Loch Skene specimens taken this season). *L. involutus*, *Succinea oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. moulinsiana*, *V. venetii*.—W. Sutton, High Claremont, Newcastle-upon-Tyne.

FRESH collected cluster-cups on *Rumex acetosa* (common Sorrel) all mounted. Offered for well-mounted slides. Send list to select from.—G. Garret, Harland House, Wetherdale Road, Ipswich.

PACKETS of foreign stamps offered in exchange for any good object of natural history.—F. S. L., 2 Oakland Villas, Redland, Bristol.

"London Catalogue," 7th ed.—59, 140, 158, 179, 245, 295, 297, 321, 333, 411, 1239, 1274, 1401, 1595, 1601, for exchange; send lists of duplicates to R. H. Hawkins, Hillside, Hastings.

EGGS of the kestrel in exchange for eggs of the cuckoo, side-blown.—J. B. Pilley, 2 High Town, Hereford.

FOR *Uromyces intrusa* (lady's mantle brand) or *Puccinia glomerata* (ragwort brand), send stamped envelope to T. Brittain, 52 Park Street, Green Heys, Manchester. No exchange required.

SHELLS, miscellaneous collection, land, freshwater, and marine (named and unnamed), in exchange for natural history books.—Henry Hyde, 2 Ellesmere Street, Regent Road, Manchester.

WANTED, Lyell's "Student's Manual," and "Principles of Geology" for "Palaeontographical Monographs," Wright's "Cretaceous Echinoderms," parts 1, 4, 8, part 2 "Fossil Shells London Clay," "Fossil Radiaria of Crag and London Clay," &c.—E. A. Walford, 72 High Street, Banbury.

BOOKS, ETC., RECEIVED.

"The Solar Illumination of the Solar System." By Collins Simon, LL.D. London: Williams and Norgate.

"Popular Science Review." July.

"Midland Naturalist." July.

"Scottish Naturalist." July.

"Canadian Entomologist." June.

"American Naturalist." June.

"Boston Journal of Chemistry." June.

"Botanische Zeitung." June.

"Potter's American Monthly." June.

"Science News." June.

"Greenhouse Flowers." Part ii.

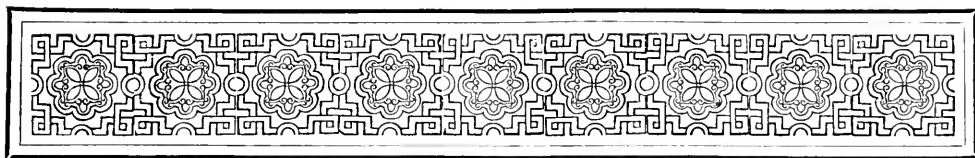
"Transactions of the Watford Natural History Society." Part iv., vol. ii.

"Ben Brierly's Journal."

"Land and Water."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—
C. P.—J. H. K.—A. J. R. S.—Dr. J. M.—H. G. W.—J. L.—
E. D.—C. L. H.—D. B.—H. F. B.—W. C. K.—E. Y. L.—
J. T. C. W.—T. W. A.—R. G.—J. A. A.—Prof. P.—T. G. H.—
J. G.—T. B. L.—C. F. W. T. W.—R. F. O.—D. H.—
F. A. B.—W. J. M.—W. B. N.—C. P.—J. P.—A. H. H.—
H. M. H.—G. S. D.—J. F. R.—G. G.—J. A.—F. H. A.—
E. E.—E. D. M.—G. C.—E. W. A.—F. S. L.—R. R.—T. S. S.—
J. H. H.—J. P. B.—W. R.—H. P.—H. H.—S. D. T.—
R. A. B.—J. E. D.—C. J. W.—W. C. H.—C. V. G.—G. E. M.—
W. J.—H. E.—W. W. S.—G. P.—J. F. G.—T. B.—
E. B. K.—W. H. H.—T. F. U.—W. W.—A. C. S.—
S. I. O. O. M.—J. B.—W. B. R.—G. A. S.—W. H. L.—E. M.—
W. H. M.—J. T.—H. C.—G. S. T.—T. C.—W. H. L.—J. M.—
E. A. W.—R. F. Z.—W. D.—J. G.—M. M.—H. H. B.—
H. H.—G. F.—R. E. C. S.—W. H. C.—J. F.—&c.



LIFE BELOW THE ICE.



MUCH has been written of late on the destruction of birds and the larvæ of insects by the long continued frost of the past winter. Can any of your scientific readers give a satisfactory explanation of how it is that fish can exist below the ice for lengthened periods, and how, under such circumstances, their respiration is maintained? Many of our mountain tarns

in this neighbourhood have been completely covered with ice, in some instances of more than two feet in thickness, for a period of not less than three months. The fish do not appear, however, to have diminished in numbers, and those captured shortly after the ice broke up were in excellent condition.

We know that fish are dependent for their respiration on the oxygen which water holds loosely in solution. By a movement of deglutition the water taken in by the mouth is passed from the pharynx into the gills, and, while escaping posteriorly through the membranous laminae of the latter, gives off its loose oxygen, which purifies the venous blood contained in the delicate vessels by which the laminae are traversed. It is a generally accepted fact that this admixture of oxygen with water is principally brought about by the perpetual agitation of the latter by storms, currents, &c. In the tanks of our public aquaria it is necessary to have a continual circulation of fresh water, or a rush of air into each tank, to prevent the fish being suffocated. In the Brighton Aquarium air is pumped into the tanks. In streams, in lochs, partially frozen over, in lochs entirely covered with ice, but supplied with large and in-

exhaustible feeders, it is not difficult to understand how the supply of air is kept up. Many tarns, however, in our lakeland, Smallwater, for instance, have no stream falling into them. Completely sealed by ice for months, their waters have had no agitation in contact with the air. Their supply of water is drawn from subterranean springs, and that it was very scanty, owing to the absence of rain and low temperature, is proved by the fact that no water escaped from the tarns by these outlets. Many of those tarns teem with fish, which must surely, sooner or later, absorb all the loose oxygen with which the water was charged previous to its being locked by ice. The demand for oxygen is unceasing, and if the usually accepted theory of aquatic existence is correct, what is the source of this supply which the experience of the late frost would almost lead us to believe to be inexhaustible?

I am aware of the exquisite balance which is maintained between land animal and plant life, and which equally exists between aquatic animal and vegetable life, by which the latter decomposes the carbonic acid given off by animals, and produces oxygen, which in its turn aerates the water. This process, however, can only take place under the influence of light, so that in the circumstances we are considering it must be to a large extent in abeyance, for in addition to two feet of ice covering the tarns, there have been six or eight inches of snow, which must have robbed plant life below of nearly, if not of all, sun light. Arctic travellers have told us that when a hole is made in the ice, fish congregate in large numbers in its vicinity, and come to the surface for air; but is it not more likely that they are attracted by the light thus admitted, just in the same manner as salmon and other fish, fascinated by the light of a torch, will lie close under it and suffer themselves to be captured by the unscrupulous poacher? Were they pining for air, it is difficult to believe that life could be maintained. In the northern latitudes, moreover, there are vast tracts of open water in communication with that which is ice-bound. There are great ocean currents, just as there are atmospheric currents, and by the former no doubt an unfailing supply of oxygenated water is being constantly carried

to those regions shut out by ice from atmospheric contact. No such conditions, however, exist with regard to our mountain tarns, and yet certain it is that the fish have not suffered in any way. This is a problem I have not seen explained, and it would be interesting to have a solution of it from some one who has examined it.

Ambleside.

PISCATOR.

THE SHEATFISH (*SILURUS GLANIS*).

AT a recent meeting of the Manchester Literary and Philosophical Society, Mr. John Plant, F.G.S., read a paper upon "The Great Sheatfish (*Silurus glanis*) in Loch Bad-a-Luacradh," and gave a sketch of the natural history of the family of the Siluridæ, which includes about a dozen known species, one of which, the *S. glanis*, inhabits some of the great rivers of Europe and a few of the lakes. It is most abundant in the Danube, Volga, and the Rhine, and is known in the largest streams which fall into the Baltic, being also at times caught in the upper regions of the Baltic, where the water is but slightly brackish. It has been obtained from Lakes Neuchatel, Brienne, and Morat; the species is also found in North American lakes and some rivers. The Sheatfish grows to an enormous size in water favourable to its mode of life. Specimens weighing seven hundred pounds are recorded from the Danube, and in America the average size of the adult fish is about three hundred pounds. The bulk of the fishes caught in the season is of less weight. The length of exceptional specimens will reach to twenty or twenty-two feet; but eight or ten feet is the length of large specimens. The general appearance of the Sheatfish is like that of a bulky eel; the eyes are large and frog-like. The head is unpleasant to look at, and the mouth wide; the upper lip is armed with two long worm-like feelers, or barbules, which are kept in active motion, either as sensitive organs of feeling, or to seize frogs and small fish which come within their reach. Its habits are to hide in the muddy bottoms or amongst the roots of aquatic vegetation—only coming to the surface on hot sunny days, after thunderstorms or when the water is frozen over—to keep an air-hole open for occasional fresh-air breathing. It has been attempted twice to introduce its spawn or young fish in English rivers; both trials have failed, although it is a hardy fish and very tenacious of life. The flesh of the Sheatfish is largely eaten in the countries where it abounds, but accounts differ as to its flavour and qualities. At one time in season it resembles fine fresh salmon in flavour, at another time white, fat, soft, luscious and not easy to digest. In the restaurants in the towns along the Danube, the Sheatfish is cooked in so many ways that a traveller may dine altogether upon this fish, and fancy he has been served with a variety of soups and meats. Whether

the *Silurus* was ever, or is now, native to British rivers and lakes is as yet an open question; the peculiar spine which supports the pectoral fin has been dug from deposits in the London clay, i.e. Eocene, and Mr. Higgins, of Liverpool, found one of these spines in clay under a bed of peat at Leasowes, on the banks of the river Dee. So far it may have lived in English rivers at more remote times. In 1828 a fish was caught in a river at Florence Court, Ireland, which was satisfactorily proved a long time afterwards by the Earl Enniskillen and Professor Louis Agassiz to be a *Silurus glanis*; not a fragment of the fish or its skeleton was preserved, which was unfortunate, as its identification depended upon memory alone and its resemblance to a drawing of *Silurus*. Dr. Fleming notices a remark by Sibbald, that the *Silurus* may have been seen in the Scotch rivers in his day. The author then stated: "Several years ago I received a letter from a gentleman residing in the highlands of Ross describing an extraordinary monster which had been occasionally seen by his servants and tenants floating on the waters of Loch Bad-a-Luacradh 'Lake of the Rushes' near the coast about Loch Eu. The people called the monster a snail whale; it seemed about twenty-two feet in length, and had two flexible horns on its mouth; it was fond of basking on the surface of the water, particularly after great storms, and looked very much like a herring boat turned keel upwards. In reply I sent a drawing and description of *Silurus glanis*, which was at once recognised by all the people who had seen the big monster as a capital portrait of it. Efforts were repeatedly taken to capture the monster by nets, by baiting, by shooting, but without success, and for three winters similar endeavours to capture it equally failed. It was ascertained by strict inquiry amongst the native residents, that the fish had been seen as far back as sixty years ago, when it was much smaller. An old shepherd had seen it first, a very old dame saw it thirty years ago, a smuggler or illicit whisky distiller who had a bothy hard by the loch often saw the monster in the quiet hours of morn; he did not like the uncanny beast as a neighbour at all." Many other witnesses who gave similar evidence were mentioned by the author, who as well described the methods adopted to capture the monster, but after much trouble and expense it proved too wary and alert to be captured or even to be shot, and the enterprise had to be abandoned. Probably the monster died, or escaped from the loch.

HOW TO RESTORE MICROPHOTOGRAPHS.—Having among my collection of microscopic objects some badly mounted microphotographs, I shall be glad to know if they can be remounted without injuring the photographs. If this is possible, perhaps some of your readers may know, and kindly describe the process by which it may be done.—*W. H. Heasman.*

ODDITIES AMONG SEA-BIRDS.

By P. Q. KEEGAN, LL.D.

IN low estuaries, by the margin of extensive bogs, when the tidal waters have receded far into the ocean, upon some long stripe of sandbank, or where some stakes, posts, buoys, or outlying rocks have been established, an imposing ornithological spectacle may not unfrequently be observed. A muster of long, lanky, long-billed, protruding-necked sea birds is there drawn up in solemn state, not steady or immovable, but rather "standing at ease" in various attitudes. Some of the birds seem to be lazily reclining upon their breasts, in the manner of a great black-backed gull; others stand erect upon their feet, supported by their stiff tail, and stare about them on every side with suspicious, half-timorous, ever-watchful eyes. Two or three members of the flock, however, are engaged in more useful occupations than these, for they busily and assiduously preen their plumage, arranging it in proper order with their beaks, and now and then giving their wings a good shake, fanning them backwards and forwards, and then stick them out "anglewise" from their flanks, in a curiously ludicrous fashion.

These feathered waifs of the sea are cormorants (*Phalacrocorax carbo*). No sooner has the receding tide exposed the more elevated shingles, sandbanks, &c., to view, than a long, spare bird, suspended on powerful pinions, may be observed to alight thereon. Another cormorant follows suit, and then another, until about twenty or so, finding the quarters suitable and safe, elect to occupy them for a brief season. Sometimes some single, solitary, wave-tossed buoy, situated in mid-channel, is observed to be surmounted by a curious bird-like organism in the shape of a sable cormorant, with ever-moving neck, white throat, and expanded or moving wings.

At certain periods of the tidal flow, a flock of cormorants, in response to the demands of appetite, resort readily to certain favourite fishing grounds—places, it may be presumed, that abound lavishly with the finny tribe. Great havoc is committed amongst the fish. It would never answer, however, if the whole of the assembled band of fishing-birds were to give way to their gluttonous propensities simultaneously; for in that case an alert and ever-watchful enemy (such as a human sea-fowler) might possibly take advantage of this temporary blindness of the cormorants, and, rushing down upon the spot, post himself at convenient range for destructive purposes, when the birds again appeared above the surface of the water. A sentinel or two is, therefore, in this case deemed indispensable; and accordingly it is observed, that one or two of the fishing flock remain above, in order to warn their co-mates who are taking their dinner below stairs, of the advent of all dangerous and suspicious characters. Frequently

when one of the cormorants has been unusually successful in his fishing expedition, having captured a fish which is rather too bulky and troublesome to manage whilst afloat, he retires to some rock or adjacent sandy beach, where the process of killing, dissecting, and devouring, may be conducted with greater facility. The wandering lover of cliff and shore scenery may frequently encounter, in some quiet retired recess or inlet of the rocks, one or two cormorants busily engaged in the operation of gorging their maws and stomachs with fishy food, the product of the sea.

The birds now under review, in addition to the clownish or ludicrous spectacle they furnish in the aforesaid method of preening their feathers, and of expanding and hanging out their wings to dry, exhibit also juggling or acrobatic talents of no mean order. Observe cormorants while engaged in their favourite occupation of fishing. A bird, after remaining in the depths of the sea perhaps for half a minute, and descending, it may be, over one hundred feet, appears upon the surface, triumphantly bearing in his long, hooked bill, a large fish (say an eel) grasped by the tail. Now, this fish being a slippery customer, the tail end thereof is not the most secure part whereby to retain it. Accordingly, the hapless finny creature is tossed upwards in the air, about a foot or so, in the manner followed by a circus juggler or acrobat, neatly caught head foremost as it descends, and forthwith discharged into the capacious gullet of the ravenous, all-devouring sea bird.

Let us now suppose that a sea-fowler of more than ordinary astuteness and perseverance, has approached within gunshot range of a locality or post, such as a wreck, a waste of surfy sand, a wave-lashed reef of rocks, etc., where a company of cormorants (either of the common or the crested species) is ranged for the combined purpose of reposing, digesting, and drying. He fires, when, lo and behold! what a dismal havoc has been apparently committed! The whole band, comprising, perhaps, some nine or ten fine birds, fall heavily, and apparently lifelessly, downwards into the water, and forthwith disappear as if into a watery grave. "Ah! what a pity it is to have slain so many beautiful and innocent creatures!" the green-hearted sportsman thinks, and perhaps also exclaims; "but then I have done well, very well indeed. I think I had better write to the *Field* forthwith," &c. This grateful elation of sporting pride is doomed, however, to be but momentary; for presently, in the vicinity of the spot where the "poor slaughtered" cormorants sunk, a curious array of beak-like protuberances appear above the sea. The extreme end of a hooked appendage, succeeded perhaps also by a small portion of a snake-like neck, is cautiously thrust above the tide with a sort of a knowing toss, a jeering look, and a general aspect sufficiently indicative of the general fact that the bird to which it appertains is yet "alive and kicking." Another and another head and neck appear in the same mysterious manner from the

depths of the sea, and again are as mysteriously and stealthily withdrawn ; and such is the effect thereof, that the "clever" sportsman at last becomes convinced that he has been made the dupe of the wily birds ; for when the shot was fired, they dropped in a prompt and nimble manner from off their snug

way. A French naturalist has observed, that the "nature of the cormorant is gentle (*douce*) and he lives in harmony with the birds who frequent the same waters. It is only gulls to whose pursuit he is disposed when they have captured a fish ; but the covetousness ceases when they have swallowed it,

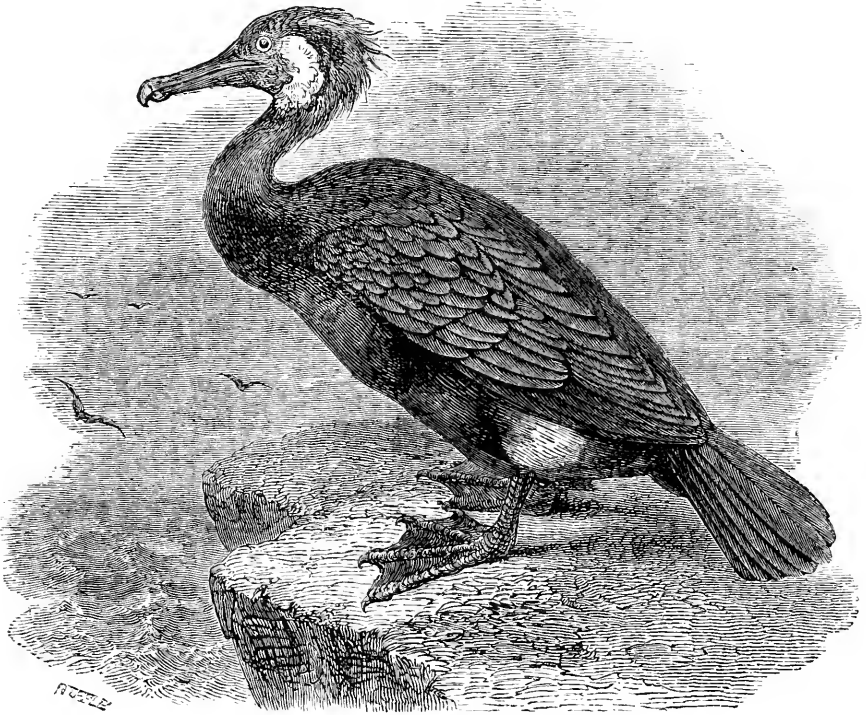


Fig. 149.—The Cormorant (*Phalacrocorax carbo*).

perches, and leaped, not "dead as mutton," but "all alive" into the opaque and sheltering recesses of the ocean.

Viewed in a general way, cormorants may be regarded as birds of eminent strength and endurance, of unshakable tenacity of life, of marvellous vigilance and cunning, of insatiable voracity, and of excessively rapid digestion. Some naturalists aver that their nature is gentle and pleasant, but we have never seen any indication about them of any special amiability. They may be pronounced "vulgar" birds. There is a coarseness, a roughness about their build, plumage, and general aspect, that certainly does not excite the æsthetic sensibilities ; and the horrible odour that emanates from their breeding places would be alone sufficient to identify them with loathsome filth and abomination. They constitute the democracy, or we might rather say the mobocracy of sea-birds ; and it is certainly true that you seldom or never see a respectable-looking bird consorting with them in any

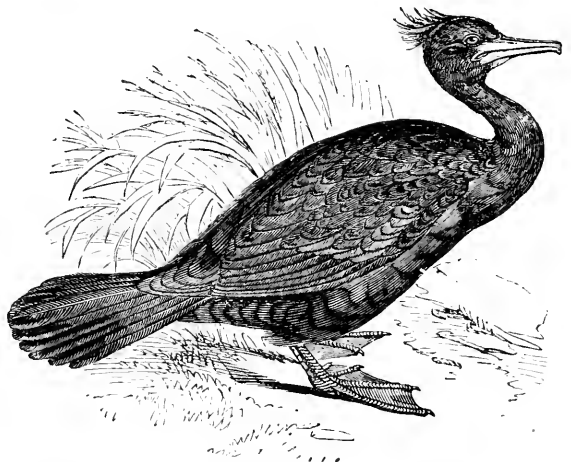


Fig. 150.—The Crested Cormorant (*Phalacrocorax cristatus*).

and he abandons all pursuit." The well-known pet cormorant of Colonel Montagu is described as beautiful, intelligent, and even troublesomely tame.

Their power of locomotion when on land being exceedingly limited (we have never seen one walking), their sociable disposition, such as it is, could hardly be exhibited to any great advantage. On various occasions we have seen numerous oyster-catchers, and even a black-backed gull or two, in the immediate vicinity of a wing-drying band of cormorants; but we never saw any hostility or discourtesy displayed on either side, each species seeming invariably disposed to mind its own business. Cormorants, moreover, being as regards sight, hearing, build, &c., and every other respect, specially adapted for a sea life, their appearance on shore may be regarded as merely for the purposes of repose and relaxation, and not, as with gulls, ducks, &c., for conjoint and harmonious consumption of shell-fish, &c.

THE STRUCTURE AND DISTRIBUTION OF SPONGES.

By the Rev. H. WALTER SYEN, M.A. Cantab.

THE nature of sponges, whether animal or vegetable, was long a disputed point with naturalists. But it is now placed beyond dispute that the sponges are really animals, and animals endowed with a very interesting and somewhat complex organisation. The general structure of a sponge is familiar to all, but it must not be supposed that the domestic "sponge" constitutes the whole or the most important portion of the animal. In fact, the part of the sponge which is used in every-day life, is little more than the skeleton forming the foundation of the animal structure. Every one is acquainted with the nature of this skeleton, consisting as it does of horny fibres interlacing and crossing in every direction, and in this manner forming a loose yet tough and strong mass of cells and passages. To this fibrous material the name "keratode" (*κέρας*, *horn*; *εἶδος*, *form*) has been applied, from its horny nature. The essential portion of the animal consists of a soft, more or less gelatinous substance, contained within and supported by this horny framework. This substance pervades all parts of the sponge, and in some cases forms the entire structure; the horny framework being entirely absent. Both the keratode and sarcode substance (*σάρξ*, *flesh*; *ὄδος*, *way*) are generally abundantly provided with calcareous or siliceous spicules, which assume various shapes and sizes. The spicules found in the sarcode are frequently radiate or star-shaped, and are hence named "stellate." Closer examination reveals the fact that the sarcode, or sponge-flesh, is not homogeneous. For, on being submitted to the microscope, it is seen that this sarcode is made up by the aggregation of a number of minute bodies, rounded in form and with a general resemblance to an Amœba. These bodies are the sponge-particles, or sarcoids, and are the ultimate constituents of the animal. Some of them

are provided with cilia, by which they are enabled to create currents in the surrounding water, the object of which is doubtless to bring food within reach of the animal. These, then, are the three portions of the bodily structure of a sponge—sarcoid matter, keratric or horny framework, and spicules. It should be noticed that the only portion which is invariably present is the flesh-substance, this being the truly essential portion of the animal. In some sponges both keratode and spicules are absent. If an ordinary "sponge" be examined, it will be noticed that the surface is provided with a great number of orifices; and some of these are, comparatively speaking, few in number and project a little from the surface. The remaining orifices are infinitely more numerous and much smaller. To the larger of these orifices the name "oscula" has been given, and to the smaller that of "pores." It is by means of the "oscula" and "pores" combined with the circulatory system connected with them that the constant passage of water through the sponge is effected. For it will be found on careful examination (which may be effected by examining a small portion of living sponge in a glass under the microscope) that currents set in at the pores, traverse the system of canals permeating the sponge, and finally escape through the oscula. It has been mentioned above that some of the sarcode particles are provided with cilia, and it is by the movements of these cilia in the main that the circulation is carried on. For it has been ascertained that within the external wall, or dermal membrane (*dermis*, *the skin*), there exist a number of chambers, the walls of which are lined with these ciliated particles, and into these chambers the pores open. The reason of this circulation is obvious. By its agency nutritious particles are brought from a distance for the use of the sponge, and effete matters are removed. It should also be noticed that this apparatus may likewise be looked upon as a mode of respiration, presenting us thus early, as it were, with an example of an aerating process in the animal kingdom. It is very possible that each particle of sarcode matter appropriates for itself, and by itself, whatever food may be thus brought in its way, much in the same manner as does the Amœba. And indeed there seems much consistency in the view which is held by some that in reality the sponge is made up of amœbæ, kept together by the fibrous framework, so that each sponge is in reality a colony of amœbæ every one of which lives independently of the rest. Be this as it may, the resemblance both in structure and in function between the ultimate sponge-particles and the amœbæ, is at the same time suggestive and striking. The development of sponges has not been quite satisfactorily worked out as yet. But it has been clearly shown that there are two distinct modes of reproduction. The first is a true sexual process, the second asexual. Examples of the first can be studied in *Tethya* and in other genera. In these cases it is found that some

of the sarcode particles take on the structure of ova, each of these being provided with a yolk and germinal vesicle. Other particles have their contents converted into spermatozoa, and by contact of these with the ova, a free-swimming embryo is produced, which, after a time, becomes attached and develops into the sponge.

The phenomena of asexual reproduction have been worked out in the freshwater sponge (*Spongilla*), and are very interesting and curious. The more central portion of the sponge gets occupied with small round bodies which have been called "gemmules." Each of these is made up of a leathery integument, and is provided with an aperture at one end.

The gemmule is invested with a layer of spicules of a peculiar shape, resembling two wheels united by an axle. Each wheel is provided with teeth. These spicules are so arranged that one "wheel" is in contact with the surface of the gemmule, the other being free. The interior of the gemmule is occupied by a number of cells, the central ones containing each a germ, and by the escape of these cells through the aperture in the gemmule, the spongilla is propagated—for each one of these germs, on reaching a suitable habitat, develops into a spongilla.

It may be mentioned that this asexual mode of reproduction in spongilla only takes place in the winter-time. Before leaving the subject of the development of sponges, it may be well to observe that recent researches render it probable that the sponges will have to be taken from their present position in the animal kingdom, and be more closely allied to the sea anemones and fresh and salt water polypes, certain discoveries in relation to the phenomena of their development making this change of position absolutely necessary by approximating them more closely to the hydrozoa and actinzoa which constitute the sub-kingdom Cœlenterata. Until recently the sponges have been regarded as forming one of the groups of the sub-kingdom Protozoa, a sub-kingdom which includes a large number of animals low down in the scale of organisation. Two specimens of this sub-kingdom may be mentioned (in addition to the sponges), *Amœba* and *Vorticella*. These animals are good representatives of the limits of the Protozoa in each direction, viz., of greatest simplicity and of greatest complexity, for the *amœba* is one of the simplest of all known animals, being strictly comparable to any one of the sponge, or sarcoid, particles already mentioned. In this creature no part of the body is differentiated, that is to say, is set aside for any one function. There is no division of labour. But the bodily functions of absorption, assimilation, digestion, and motion, are performed by any portion of the body indifferently. Such an animal is indeed of a simple organisation, and much resembles a portion of animated jelly. On the other hand the *vorticella* is, comparatively speaking, of a complex organisation, possessing considerable differentiation

of tissues and organs, and being provided with a mouth and short digestive canal. The beautiful appearance presented by the graceful *vorticella*, with its spiral stalk passing through different stages of compression and extension, must be well known to all microscopical observers.

The affinities of sponges have long been disputed points with comparative anatomists; some endeavouring to show that the sponges are closely allied to the Infusoria. Others, again, as has been mentioned above, from recent observations think, and with much probability, that the sponges would be removed to the Cœlenterata. It is not, however, the purpose of this paper to enter into the question, which to be adequately understood, requires a considerable acquaintance with the formal facts of comparative anatomy and of embryology.

Having thus given in brief outline some of the leading facts concerning the structure and physiology of the sponges, it will be necessary to say a few words on the distribution, both in space and time, of this interesting group of animals. As regards distribution in space, the sponges are almost entirely confined to salt water, the genus *Spongilla* comprising the only fresh-water sponges. They occur almost universally; but those whose structure especially fits them for domestic use are obtained chiefly from the islands of the Grecian Archipelago, and from the Bahamas. It will, of course, be perceived that the species provided with a horny skeleton, and comparatively devoid of spicules, are those which are most valuable as a commercial article. Other things being equal, the utility of the sponge will vary inversely as the density of the skeleton and the number and hardness of the spicules. Sponges occur chiefly between high and low water marks, and are found in most luxuriance and abundance in tropical seas. It has been shown that the siliceous sponges mostly occur at great depths in the ocean. There is one genus which is worthy of notice from its habit of boring cavities in shells—this genus is *Cliona*. Fossil-shells from the Silurian are found bored in this manner, excavated doubtless by a boring-sponge. Sponges are very widely distributed in time. Indeed, from the Palæozoic strata upwards, sponges occur in many formations. The maximum of abundance is reached in the chalk. And it is worthy of notice that the flints of the upper chalk are formed round sponges, forming the nucleus, as it were, or centre of deposition. On sections being made of certain flints, minute spherical bodies, provided with spines, have been discovered, and to these the name *Xanthidia* has been applied. Some observers regard these as the gemmules of sponges; but on this point there is considerable difference of opinion, as there is some reason for regarding them as members of the vegetable kingdom, namely, the spore cases of Desmids. (?) It is obvious that the only trace left by the horny sponges can be owing to their spicules, and consequently remains of these sponges are rare.

The chief group of fossil-sponges is called *Petrospongiadæ* (*πέτρος*, stone). Of this group, *Sparsispongia* is found in the Devonian, and *Ventriculites* in the chalk formations.

Lower Silurian sponges are *Palæospongia* and *Acanthospongia*; *Sparsispongia* is found frequently in the Devonian. As already observed, the chalk is richest in sponges, and the most important genera there occurring are *Siphonia* and the aforementioned *Ventriculites*. It is a curious fact that the fauna of the Cretaceous epoch is reproduced, as it were, at great depths in the ocean; for at these great depths Foraminifera, Crinoidea (Echinoderms), and Spongiadæ are associated in a manner highly characteristic of the chalk formation.

A few words must be added on the classification of sponges. And it must be confessed that this part of the subject is far from being satisfactorily worked out. The arrangement of Dr. Bowerbank is the one generally adopted. In this classification three orders are formed; the nature of the skeleton being used as the classificatory medium. The first order *Keratosa*, comprises the horny sponges, whose skeletons are furnished in a greater or less degree with spicula. This order is generally regarded as the lowest. The second order, *Calcarea*, includes the sponges whose skeleton is composed of lime, and the third order, *Silicea*, comprises the siliceous or flinty sponges. In these last the skeleton is made up either of continuous interlacing siliceous fibres, or else of siliceous spicules. The form of the spicules is subject to great modifications; though in the same part of the animal they are constant for a particular species. They form interesting microscopical objects, the different forms being so well marked and manifold in number.

In conclusion, it may be noticed that fossil sponges are more intimately allied to the forms which now flourish in tropical countries than to other kinds. And hence we see one proof of the fact, which is also deducible from other phenomena, that at the epoch when these sponges existed as living beings, a climate prevailed over a great portion of the globe which must have been very conformable to that now existing in tropical countries. So that, from the study of the life-history of such humble creatures as the sponges, we are led to infer that the climate of the earth was not always as we now find it, but that tropical heat once called forth a luxuriant flora and fauna in districts where now arid sterility and desolation prevail, and that icy seas and inhospitable shores now exist where formerly sponges flourished, and the ocean teemed with animal life in a manner somewhat similar to what we now see in the tropical oceans of the world. Considerations such as these would certainly point out to us the advisability of carefully attending to the anatomy and functions of the lower orders of animals and plants; for it has been in the past, and will be in the future, that observations on

these points, carried out on strictly inductive principles, have led to some of the most magnificent and comprehensive discoveries and generalisations by which the progress of science has been advanced.

INTERESTING PLANTS IN THE ROYAL GARDENS, KEW.

ONE of the greatest curiosities of the vegetable world is now growing in these gardens, viz. *Welwitschia mirabilis*, and although dried specimens of this remarkable plant are frequently seen, it has never been the good fortune of any person to see a living plant of moderate size in this country before. Seeds have been received at Kew which have germinated, but, from unknown causes, they have invariably died shortly afterwards. The specimen under consideration was imported a few months since, and after being carefully attended for some time has lately commenced a somewhat uncertain growth. This wonderful plant was discovered by the late Dr. Welwitsch on the elevated dry sandy plateau, near the Benguela coast of West Tropical Africa, where it forms a peculiar feature in the landscape. The stems rarely exceed one foot in height, but frequently attain a diameter of three feet, and the two cotyledons are, with the exception of the flowers, the only appendages produced, and these remain attached to the stems and continue to increase in length during the whole life of the plant, which in its native country exceeds a hundred years. On old plants the cotyledons are more than six feet long, and about two or three in width, and they are torn by the wind into long strips which trail on the ground, and flutter about in every gust that blows. From the margin of the stem above the cotyledons rises the dichotomous inflorescence on the divisions of which are borne terminal cones composed of imbricated scarlet bracts in four rows, each bract enclosing an extremely simple flower. After flowering, the cones increase to about two inches in length. It can readily be imagined how strange these stunted stems must appear dotted about over a level country, but we can scarcely realise the feelings of Dr. Welwitsch when he first beheld this abnormal member of the vegetable kingdom. The specimen growing at Kew was recently exhibited at a meeting of the Linnean Society, when it attracted considerable attention, as it was the first living plant ever exhibited before the society, and more especially as the plant is not in very vigorous health, and therefore the duration of its life may be rather short. From observations made at Kew the growth of the cotyledon appears to be entirely basal, and to proceed at the rate of about 5-10 mm. per month. We might mention that considerable doubt existed at one time concerning the classification of the *Welwitschia*, but Dr. Hooker some time since definitely referred it to *Gnetaceæ*, a tribe of *Coniferæ*.

LEWIS CASTLE.

HINTS FOR YOUNG MICROSCOPISTS.

No. 2.

IN my last paper I referred to a steady head as a requisite to correct drawing with the camera. I would now direct attention to the necessity of a steady hand in dissection under the compound microscope. For ordinary purposes, no doubt, a single convex lens is quite sufficient. But when delicate dissections are required, one has only to transfer the object supposed to be distinctly seen to the stage of the compound microscope to perceive at once that much had not been noticed. Supposing then that a small compound microscope with B eye-piece, one inch objective and an erector be used, the following arrangement for a dissecting table will be found most helpful.

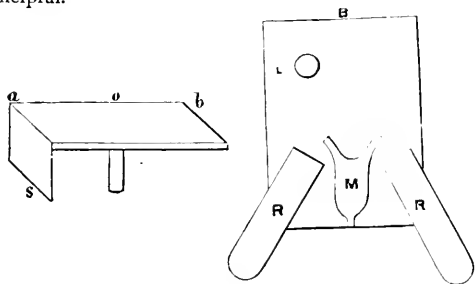


Fig. 151.—Details of Dissecting Table.

A strong low table of the dimensions now given, and standing on four substantial legs, should be obtained. Height twenty-two inches, top nineteen inches by fifteen, the narrower width being from right to left. Upon this table are placed two arm supports, a side view of which is here given. Length from *a* to *b* twelve inches; width four inches, and height five inches. These are so placed as to admit the microscope to stand between them, and the height of the arm rests should correspond with the height of the stage when the microscope is placed perpendicularly. The portion of the rest from *o* to *b* comes over the edge of the table upon the thighs, so as to afford a complete support for half the forearm. These rests are attached to the table only at *s*, where a screw passes from under the table upwards into the middle of the piece of wood *a s*, and so enables the rest to be moved as on a pivot, inwards or outwards, as desired. The top of the table will be then represented by the figure B, where M is the microscope RR the rests, L the lamp. The dissector then places himself on an ordinary chair, draws himself to the table so that his thighs pass under the rests, and goes to work. The height of the table and of the rests can easily be varied a little to suit the operator.

The writer has tried various forms of dissecting tables and rests, but has found none so completely steady as the above.

Codicote Vicarage.

T. R. I.

A NEW ROTIFER.

SEND you a sketch of a rotifer new to me, which I have found on some weeds in one of my glass aquariums. It has only one wheel or ciliated disk; it is very small, and when first observed I took it for a young *Tubicolaria Najas*, as like them it has an irregular case of a gelatinous substance and was surrounded with brownish filaments which are continually added to the case, and in time renders it so thick that the motion of the creature within the case is very imperfectly seen. I concluded that it was not a young *najas*, as there were two eggs at the bottom of the case, which had passed out of the body and lodged there; this proved to me that the creature was

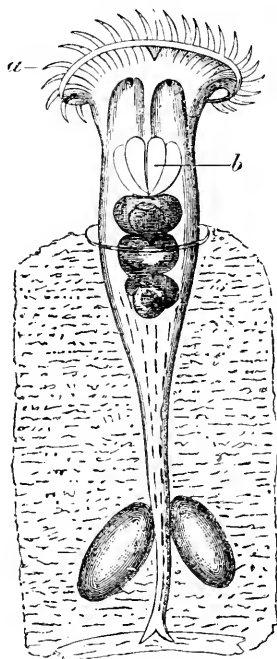


Fig. 152.—A new Rotifer. (?)

a matured one. The eggs I carefully watched, hoping to see the development of them, but the case becoming so thick prevented this. I have found several of them. I make them out to be about $\frac{1}{1000}$ inch in length when fully exerted. Some of them display two eyes (at A) of a very brilliant red colour.

The jaws (at B) are large in proportion to its size, and the cilia are also long, and produce by their action a powerful current or vortex in the water. I have observed some young ones swimming at a swift rate through the water previously to their becoming fixed. When first fixed down they are very transparent, and the action of the cirlet of cilia at the head is plainly seen, and also the jaws in motion; indeed, at this time, scarcely any other parts of the body are visible

with the exception of the outline of the creature; but very soon the gelatinous case begins to form round the lower part of the body: at this stage the animal measured about $\frac{1}{1000}$ inch in length. The name of this rotifer (if it has one) I do not know, perhaps some one of the many readers of SCIENCE-GOSSIP may recognise it.

J. FULLAGER.

AIDS TO THE CHOICE OF BOOKS ON BOTANY.*

By BERNARD HOBSON.

(Continued from p. 183.)

SINCE writing the former part of this paper, I have obtained such a mass of particulars as to rather embarrass me; this must be my excuse for involuntary omissions and want of clear arrangement.

The Third edition of Lindley's "Vegetable Kingdom" was published by Bradbury & Evans, in 1853, at 36s. It contains 908 pages, 98 pages of index, and 526 illustrations, with list of all species then known.

I have received four letters recommending "Botany, Outlines of Morphology and Physiology," 42 diagrams; and "Botany, Outlines of the Classification of Plants," 118 diagrams, both by Prof. W. R. McNab, M.D., foolscap 8vo., 1s. 6d. each; Longmans. The cheapest books I have ever seen are W. Bland's "Elementary Botany," Pt. I. (Organography) 140 cuts, Pt. II. (Physiology) 100 cuts, 6d. each; Bemrose. "Botany," by Robert Bentley, F.L.S., foolscap 8vo., cloth, 128 pages, with illustrations, 1s., published by the Society for Promoting Christian Knowledge, is a very good little book; the same Society are the publishers of the astonishingly cheap "Flowers of the Field," by the Rev. C. A. Johns, B.A., F.L.S., 663 pages, with 413 really excellent woodcuts, being, as far as I can judge from cursory examination, a complete Flora of phanerogamous plants, on the natural system, with 59 additional pages, enabling it to be used on the Linnaean system, Thirteenth edition (1878), 12mo., 5s. The same publishers issue "Wild Flowers," by Anne Pratt, 2 vols., each 4 by 5½ inches, 16s., with 192 full-page plates of as many species beautifully printed in colours, a book for children, quite unscientific, but excellent for promoting the love of flowers.

H. Baillon's "Natural History of Plants," not finished yet, 5 vols., 1800 engravings, 25s. each; Reeves.

"Introduction to Structural and Systematic Botany," with over 1300 woodcuts, post 8vo., fifth edition, an American book, by the celebrated Dr. Asa Gray, costs 18s.; his "First Lessons," with 360 engravings, post 8vo., 7s. 6d., both nett.

The "Elementary Course of Botany," of Prof. A. Henfrey, F.R.S., F.L.S., Third edition, by Dr.

Masters, with over 600 woodcuts, post 8vo., is priced 15s.; Van Voorst.

"Vegetable Physiology and Botany," by the illustrious Dr. W. B. Carpenter, new edition, several hundred illustrations, is 6s.; Bell & Daldy.

"Vegetable Teratology" (or monstrosities), by Dr. M. T. Masters, 216 woodcuts, 8vo. Ray Society, about 15s. 6d. The following are "British Floras" not already mentioned:— "Florigraphia Britannica," by R. Deakin, M.D., 4 vols. 8vo., illustrations, 2½ by 2 inches (rather old-fashioned) of every species (1625), Linnaean and natural system, £5, plates coloured (not too well); or £3 10s. plates plain. Groombridge.

Hooker and Arnott's "British Flora," £1 1s., Longmans, is a standard work.

"British Wild Flowers," including ferns, horse-tails, and club-mosses, by C. Pierpoint Johnson, with 1780 coloured illustrations, by J. E. Sowerby, large 8vo., £3 3s.; Van Voorst. "Tourist's Flora of British Isles, France, Germany, Italy, Switzerland," by J. Woods, F.L.S., demy 8vo., 504 pp., 18s.; Reeve.

Babington's "Manual" may be had on thin paper for the pocket at 12s., roan; Van Voorst. Benthams' Handbook is published at 12s., without illustrations; 680 pp.

"British and Garden Botany," by Leo H. Grindon, describes native flowering plants and ferns, and all garden plants commonly cultivated, with introduction to botany, 232 engravings, 12s.; F. Pitman, London.

"Handbook of British Plants," by W. Lowndes Notcutt, with index, &c., by Robert Hogg, LL.D., F.L.S.; 3s. 6d.; Journal of Horticulture Office. "School Flora," by W. M. Watts, D.Sc. Lon., a general Flora with special reference to Giggleswick (West Riding of Yorkshire), several cuts, crown 8vo., 2s. 6d.; F. Warne & Co.

"Handbook of British Plants," A. Irvine, 7s. 6d.; Nelson, 1858 (recommended by a practical botanist). New edition of Withering's "British Plants," 10s. 6d.; Low, 1863. "Key to British Wild Plants," T. Baxter, 1s.; Simpkin, 1871. M. J. Berkeley's "British Flora," (cryptogamic) mosses, lichens, algae, &c., 8vo., 1844, 12s. "London Catalogue of British Plants," seventh edition, 8vo., sewn 6d.; Bogue (a list without specific characters or any descriptions). Out of print, no descriptions, but lists of localities. H. C. Watson's "Cybele Britannica," 4 vols., 5s. each. "Compendium" of same, 10s., 651 pp.; Longmans. On Economic Botany, is "Domestic Botany" (structure, classification, uses of plants), by J. Smith, A.L.S., 16 coloured plates, demy 8vo., 16s.; Lovell Reeve. F. J. Meyen's "Outlines of the Geography of Plants" (also culture and uses), 8vo., 12s., Ray Society, 1846, is a very celebrated work.

Sir Joseph Paxton's "Botanical Dictionary" contains all species known up to time of publication, with colour of flowers, season, temperature, habitude, duration, height, native country, year of introduction,

* Any of the books referred to in this article may be obtained from Mr. David Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

but no description or diagnoses (being, in fact, a book for gardeners), imp. 8vo., 623 pages, no illustrations, 25s.; Bradbury & Evans. "Dictionary of Dichlamydeous Dicotyledons" (characters of genera and species, culture, uses, &c.), by George Don, F.L.S., 4 vols. 4to., 3468 pages, strictly scientific (natural system) woodcuts, £14 8s.; Rivington, &c., now to be had at about 15s.

Loudon's "Encyclopædia of Plants" (is, or was, on Linnæan system) specific character, description, culture, history of *all* plants known in Britain, with small and crowded but good cuts of 12,000 species, a standard work, 8vo., 42s.; Longmans. Dr. Lindley and Moore's "Treasury (or Dictionary) of Botany," with glossary, 274 cuts, 20 steel plates, two parts, foolscap 8vo., 12s.; Longmans. "Dictionnaire Universel et Manuel de Botanique et Horticulure," Dr. Hoefler, 4 francs; Firmin Didot, Paris.

Miscellaneous works relating to fertilisation, &c.:

"Flowers, their Origin, Shapes, Perfumes, and Colours," by Dr. Taylor, editor of this "SCIENCE-GOSSIP," 32 coloured figs., 161 cuts, crown 8vo., 7s. 6d.; David Bogue. A very interesting book, requiring no previous knowledge of botany.

Sir John Lubbock, in his excellent little book "On British Wild Flowers, considered in relation to Insects," goes systematically through the British Flora, giving numerous illustrative cuts, crown 8vo., 4s. 6d.; Macmillan. The great Mr. Charles Darwin, F.R.S., is author of "Effects of Cross and Self-Fertilisation in the Vegetable Kingdom," 12s.; "Various Contrivances by which Orchids are Fertilised by Insects," 9s.; "Different Forms of Flowers on Plants of the Same Species," 10s. 6d.; "Insectivorous Plants," 14s.; "Movements and Habits of Climbing Plants," 6s.; "Variation of Animals and Plants under Domestication," 2 vols., 18s., mostly illustrated, all crown 8vo.; John Murray.

On ferns there are innumerable books, *e.g.* "Synopsis Filicum," all known ferns, figures of characters of each genus, by Sir W. J. Hooker, F.R.S., and J. G. Baker, 8vo., £1 2s. 6d. plain, £1 8s. coloured; David Bogue. "Species Filicum" of all known ferns, with 304 uncoloured plates, each $7\frac{1}{2}$ by $4\frac{1}{4}$ inches, by Sir W. J. Hooker, 5 vols., 8vo. (1846-64); £7 8s.; W. Pamplin. "Historia Filicum," organography, characters of genera, list of species, &c., 30 plates of characters, demy 8vo., 12s. 6d.; Macmillan. "European Ferns," by James Britten, F.L.S., with coloured plates painted from nature by D. Blair, F.L.S., and numerous wood engravings, in monthly parts 7d.; Cassell. "Natural History of British and Exotic Ferns," 479 coloured plates, 8 vols., £6 6s.; "New and Rare Ferns" (not in the preceding), 72 coloured plates and cuts, £1 1s.; "Our Native Ferns," 50 species, 1300 varieties, 79 coloured plates, 900 engravings, £2 2s., all by E. J. Lowe; Bell & Daldy. "Ferns, British and Foreign" (history, organography, classification, culture, list of species

of garden ferns, index of genera and species), third edition, woodcuts, by J. Smith, A.L.S., crown 8vo., 7s. 6d.; David Bogue. "Ferns of the British Isles," described and photographed by Sy. C., 20 plates, giving all species, woodcuts and glossary, 8vo., 10s. 6d.; Van Voorst. "Ferns of Great Britain and Ireland, nature printed," imp. folio, 51 large coloured plates, about £5 5s. net; Bradbury. "Octavo nature printed British Ferns," 169 plates, 500 pages, 2 vols., £4 4s.; Bradbury. "History of British Ferns," 22 plates, coloured, 5s.; "British Ferns and their Allies," 12 coloured plates, Third edition, 5s.; the same in boards, plates plain, 1s. (a good little book); Routledge. "Handbook of British Ferns," 5s.; Groombridge. All by Thomas Moore, F.L.S. Sir J. W. Hooker's "British Ferns," analysis of fructification; 66 coloured plates; royal 8vo., £2 2s.; Reeve. M. Plue's "British Ferns" (and lycopods, equisetæ); structure, cultivation, diseases, uses, preservation, distribution; 16 coloured plates, 55 cuts, 10s. 6d.; Reeve. Seemann's "British Ferns at one View," 8vo., coloured, 6s.; Van Voorst. "Fern Paradise" (a Plea, &c.); 4 photographs, 8 views, 8 plates, Fourth edition, 8vo., 12s. 6d. "Fern World," 4 views, 12 coloured nature printed plates, third edition, 8vo., 12s. 6d., both by F. G. Heath; Low. "The Fern Garden," beautiful coloured plates, by Shirley Hibberd, 3s. 6d.; Groombridge. "Fern Book for Everybody," cuts and plates, M. C. Cooke, foolscap 8vo., cloth, 1s.; Warne.

"British Mosses," every species figured on 39 coloured plates, and described, 2 vols. royal 8vo., by F. E. Tripp, £2 10s.; Bell. Wilson's "Bryologia Britannica" (mosses), a new edition of Hooker & Taylor's "Muscologia Britannica," 61 plates, plain £2 2s., coloured £4 4s.; Longmans (is still the only complete standard). Rev. M. J. Berkeley's "Handbook of all British Mosses," 24 coloured plates, 8vo., 21s.; Reeve. Hobkirk's "Synopsis," 10s. 6d.; Reeve (no cuts, unsuited for beginners); and R. M. Stark's "History of British Mosses," 20 coloured plates, 7s. 6d.; Routledge. "The Lichen Flora of Great Britain, Ireland, &c.," by Rev. W. A. Leighton, F.L.S., second edition, foolscap 8vo., 16s.; David Bogue; third edition, 21s. 10½d. "History of British Lichens," by W. L. Lindsay, M.D., 22 coloured plates, 5s.; Routledge (which see for List of lichenological works). "Lichenes Britannici," in Latin, Crombie, 2s. 6d.; Reeve. "London Catalogue of British Mosses," 4d.; Blow, Welwyn, Hertfordshire. "Easy Guide to British Hepaticæ;" M. C. Cooke; figures of 136 species, 200 cuts in all, 4d.; Bogue.

"Phycologia Britannica" (sea-weeds) generic and specific characters and descriptions, 360 splendid coloured plates, 4 vols., royal 8vo., £7 10s.; Reeve. "British Marine Algæ" (all species), 27 plates of genera; coloured £1 11s. 6d.; plain 21s., 8vo., both by W. H. Harvey; Van Voorst; also, by the same, "British Sea-weeds," 5s.; Reeve, 1857. "British

Sea-weeds," drawn from the above "Phycologia," with 80 plates, or 380 beautifully coloured illustrations, by Mrs. A. Gatty; 2 vols., £2 10s.; Bell. "British Sea-weeds," nature printed by Johnstone Croall, 4 vols., royal 8vo., 210 plates beautifully coloured, with magnified dissections of all species, £5 5s.; Bradbury. "British Sea-weeds," by S. O. Gray (all species); 16 coloured plates by Fitch, 10s. 6d.; Reeve. Grattan's "British Marine Algæ," 205 capital engravings, but not well arranged, 5s. 6d.; Bazaar Office, Wellington Street. "History of British Sea-weeds," Dr. Landsborough, 20 plates, coloured, 5s.; Routledge. "Sea-weeds," by Mrs. Lane Clarke, 10 original tinted lithographic plates, 1s.; Warne. Christian Knowledge Society's "Sea-weeds," coloured plates, 1s. 8d. Dr. Hassall's "History of British Freshwater Algæ, Desmidiæ, Diatomaceæ," 2 vols. 8vo., 103 plates, £1 15s.; Longmans.

"Outlines of British Fungology," by Rev. M. J. Berkeley, F.L.S., characters of over 1000 species, and list of all indigenous, 8vo., 24 coloured plates, 30s.; Reeve. "Handbook of British Fungi," 2 vols., cuts and tinted plates, 24s.; Macmillan (entirely technical and unintelligible to tyros); "A Plain and Easy Account of the British Fungi," Third edition, coloured plates of 40 species, foolscap 8vo., 6s.; D. Bogue; "Fungi, their Nature, Influences, Uses, &c.," edited by Berkeley, profusely illustrated, 8vo., 5s.; King & Co., all by M. C. Cooke, M.A., LL.D. By the same, "Rust, Smut, Mildew, and Mould," (microscopic fungi) 16 plates, or 269 beautiful coloured figs., 238 pages, foolscap 8vo., 6s.; D. Bogue.

Dr. Badham's "Esculent Funguses of England," (history, uses, characters, structures, cooking) 12 coloured plates, 8vo., 12s.; Reeve. "Mushrooms and Toadstools," Worthington Smith, F.L.S., two large sheets, coloured figs., natural size, 29 edible, 31 poisonous species, with description, 6s.; D. Bogue. "Grevillea," a periodical on Cryptogamic Botany and its literature, edited by M. C. Cooke; Williams & Norgate, 14 Henrietta Street.

"The Journal of Botany, British and Foreign" annual subs., 12s. in advance, published monthly by West, Newman, & Co., 54 Hatton Garden, E.C.

NOTES ON INFLORESCENCE.

HAVING for some years paid considerable attention to the study of Inflorescence, I cannot but be pleased to find it recommended to your readers, as it is in your July number. It is indeed to be regretted that "an immense amount of mischief has been wrought to true botany by the ambiguous, loose, and inaccurate use of terms." To begin with the term axillary, which has been applied alike to the flowers of the periwinkle and the pimpernel. The resemblance between the flower arrangement of these two plants is apparent—the difference is

real. Flowers of the pimpernel appear in the axils of opposite leaves and are themselves opposite. Nobody has ever seen two flowers opposite each other in the periwinkle. Its leaves are opposite, its flowers are unilateral, as those of the forget-me-not. When it happens, as it sometimes does, that a solitary leaf appears in connection with a flower, the flower is opposite the leaf, not axillary to it. The best botanists affirm that when a flower is opposite a leaf it is truly terminal. Then as to the corymb and the umbel being forms of indefinite inflorescence. I suppose the best example of a corymb is to be found in the pear, which regularly has a terminal flower. Such a flower is also to be found in the umbel of the carrot, and many other plants of the same order, which ought no longer to be called Umbelliferae, if we are to restrict the term umbel to those cases in which it is indefinite, as in the cowslip and polyanthus. The spike of agrimony is terminated by a flower which expands before that next below it. The staminate flowers of *Mercurialis perennis* are in a pendulous spike with a flower at the end, which is the first to open. The spike of plantago is indefinite. Thus we find several words used in describing forms of inflorescence in a sense as vague as that of panicle. It is to be desired that the use of the term panicle should be discontinued by those who regard it as a form of indefinite inflorescence. It is not easy to say why there should be a special name for a compound raceme, as there is not for a compound umbel. Indeed there are few instances in which such a name would be applicable. Perhaps one may be found in Yucca, where the flowers are large and numerous enough to attract attention. The inflorescence of the cauliflower might be also called a panicle, in the same sense, but it is not often. An abnormal form of inflorescence in a plantain affords another instance. But in almost, if not quite every instance in which British botanists mention a panicle, it is in the sense in which I have ventured to describe it in my "First Catechism of Botany" as a "compound corymb or raceme in which the branches of the peduncle branch again as in the London pride or the great broad-leaved saxifrage." Whoever will examine either of these plants in flower, may find a flower crowning the peduncle and one at the end of every branch, as well as on the tertiary branches. It is likewise in the lilac of which Professor Lindley describes the inflorescence as a panicle, so that in these familiar instances, the panicle is as truly a form of definite inflorescence as is the forked panicle of *Stellaria*. It would indeed be better in using such terms as corymb, spike, and umbel, which were invented and defined before the difference between definite and indefinite inflorescence was made out, to add the adjective definite or indefinite, so as to say, for instance, that flowers of the cowslip are in an indefinite simple umbel, those of the carrot in a compound definite umbel.

JOHN GIBBS.

THE CEPHALOPODA OF THE CHALK MARL AND UPPER GREENSAND, ISLE OF WIGHT.

DURING the past winter I have carefully searched the quarries and sections of cliff in the neighbourhood of Ventnor for some of the better fossils of the chalk marl and upper greensand, and I heartily recommend this locality to the notice of collectors. A deserted quarry behind Bonchurch, which is called "St. Boniface Quarry," will yield a great variety of good fossils, provided a diligent search is made. In the three feet of fossiliferous marl, which is here exposed, I have obtained *Turrilites tuberculatus* (fig. 154), but, as in the case of all the turrilites, it will be found difficult to extract anything like perfect specimens; the reason of this difficulty is that invariably the turrilites will be found at right angles to the stratification, consequently the fossil is more liable to get broken, unless great care has been taken in breaking the marl. *Turrilites* (No. 158), of which I only succeeded in preserving three coils, appears to me a variety of "tuberculata," having three rows of

in my cabinet, was found in the chalk marl on the Ventnor beach; it differs from *undulatus* in having the ridges on each coil divided into two distinct parts instead of one long and rather curved line. *Turrilites Bergerii* (fig. 159), I found in the chloritic marl between



Fig. 155.—*Turrilites undulatus*.

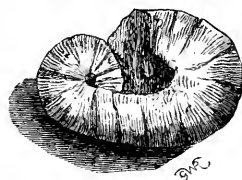


Fig. 156.—*Scaphites aequalis*.

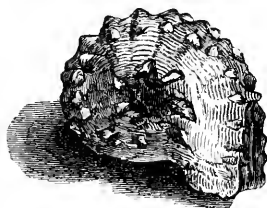


Fig. 157.—*Ammonites falcatus*.

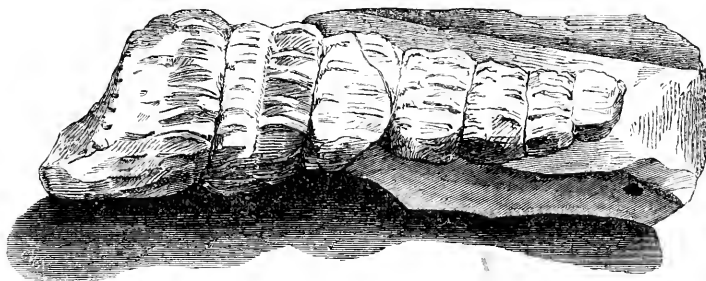


Fig. 153.—*Turrilites costatus*.

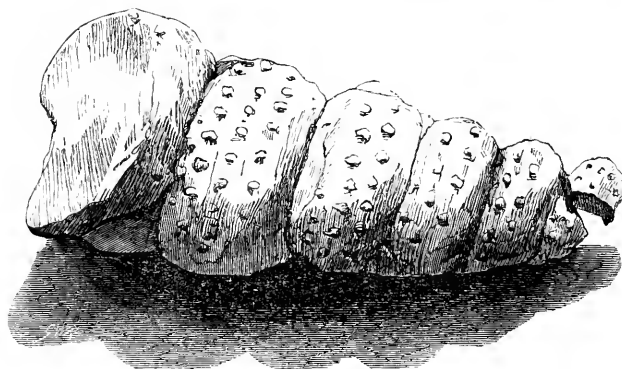


Fig. 154.—*Turrilites tuberculatus*.



Fig. 158.—*Turrilites* (sp.)



Fig. 159.—*Turrilites Bergerii*.

tubercles on each coil instead of five, as in the larger specimen. *Turrilites undulatus* (fig. 155) is the one most frequently to be met with in the lower chalk of the Isle of Wight, but we consider it a rare prize if a specimen is obtained having the upper coils perfect. *Turrilites costatus* (fig. 153), perhaps the best specimen

Ventnor and St. Lawrence; this fossil is peculiar to the formation, imperfect specimens being exceedingly common. In Sir Charles Lyell's "Elements of Geology," (page 282) the chloritic marl will be found classified with the upper greensand, whereas local geologists have been inclined to place it distinct

between the chalk marl and the greensand ; in either case the formation is a curious débris of former rocks, occasionally even oolitic fossils being found associated with mollusca peculiar to the greensand. In the Isle of Wight the upper greensand is about fifty feet in thickness, the chloritic marl forming about the upper four feet of this series of rocks. *Hamitis attenuatus* (fig. 160), derived from hamus, a hook, is a rare fossil

Nautilus expansus being common in the chloritic marl at St. Lawrence. The ammonites are well represented in lower chalk, chalk marl, and greensand. I figure three of the best specimens, *A. Cooperii* (fig. 164), chloritic marl ; *A. falcatus* (fig. 157), *A. Mantellii* (fig. 163) lower chalk and chalk marl.

In this short article I have confined myself to the Cephalopoda, but all the characteristic fossils of the

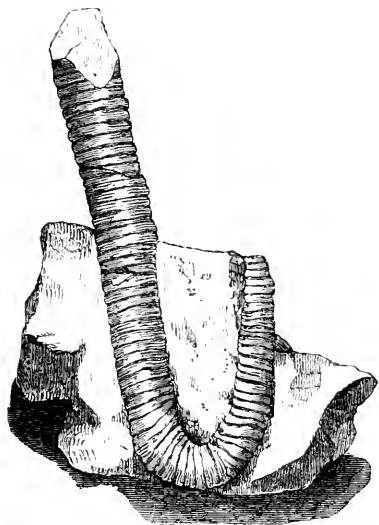


Fig. 160.—*Hamitis attenuatus*.

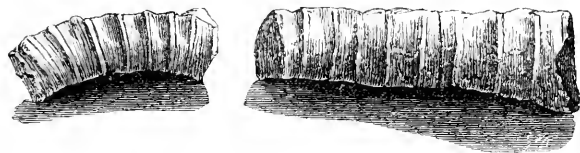


Fig. 161.—Fragments of *H. attenuatus*.

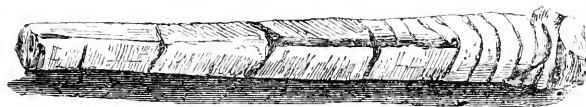


Fig. 162.—*Baculites anceps*.

which I obtained with great difficulty from the lower chalk beds ; this is a fine specimen, showing the separate courses. The fragments (fig. 161) were all from the chloritic marl, and are of various species ; in Woodward's "Mollusca," fifty-eight species of *Hamites* are mentioned. *Baculites anceps* (fig. 162) also comes from the lower chalk, from the St. Boniface Quarry ; the valve and four chambers are in this specimen distinctly marked. *Scaphites aequalis* (fig. 156), occurs in one particular band of the chalk marl, a few inches only in depth ; once hit on the exact line, and several specimens may be obtained. *Nautilus elegans* is to be found in St. Boniface Quarry occasionally,

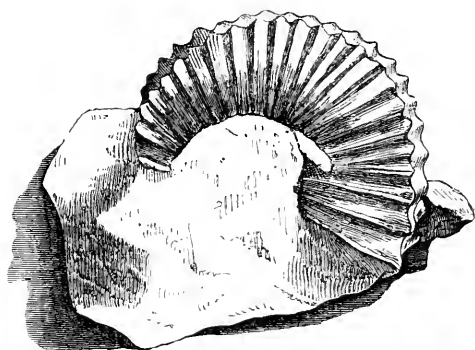


Fig. 163.—*Ammonites Mantellii*.

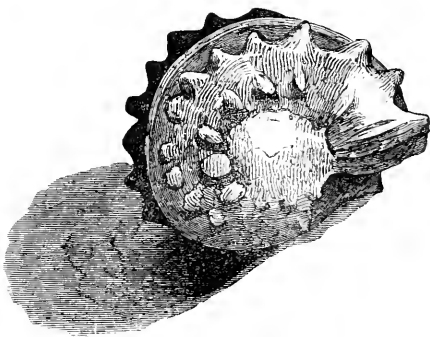


Fig. 164.—*Ammonites Cooperii*.

three formations are to be found. In my cabinet I have teeth and vertebrae of sharks and fish ; shells of the various families, *Trigonia*, *Natica*, *Cucullus*, *Venus*, *Pecten*, *Ostrea*, *Actæon*, *Trochus*, *Pleurotomaria*, *Prinopæa*, *Lima*, *Cardium*, *Terebratula*, &c. ; also the various Echinites.

C. PARKINSON.

PARASITES ON HEDGEHOGS.—Have hedgehogs parasites, and, if any, have they ever fleas, and have they any means of ridding themselves of them ? I read the article last July "My Hedgehogs." I have a hedgehog, and a friend of mine tells me they have fleas. I have never noticed it, and rather doubt the probability of nature having allowed an animal of that peculiar growth to be afflicted in such a manner. —*Singer Barclay*.

MICROSCOPY.

QUEKETT MICROSCOPICAL CLUB.—The fourteenth annual meeting was held at University College on July 25, Professor T. H. Huxley, F.R.S., D.C.L., president, in the chair. The report of the committee referred with satisfaction to the continued prosperity and usefulness of the club, the present number of members being stated as five hundred and eighty. Five members had died during the past year, of two of whom—Mr. P. Le Neve Foster and Dr. W. Tilbury Fox—brief obituary notices were given. The report stated that the attendance at the meetings had been greater than during any previous year, many valuable papers had been read, numerous additions to the library and cabinets had been made, and a new catalogue of the slides in the latter had been issued. The field excursions during the year had to some extent been interfered with by the unfavourable weather; cordial relations had been maintained with kindred societies, and the report concluded with an acknowledgment of the value of the services rendered by the honorary officers of the society. The treasurer's annual statement of account was also submitted to the meeting, and showed that the total receipts had amounted to £373 10s. 7d. of which there remained a balance in hand of £87 9s. 3d. The president then delivered the customary annual address, in the course of which he pointed out such lines of study as might be followed out by the members of the club with great advantage to themselves and to the interests of science at large, and showed them that they were in the possession of facilities for carrying such inquiries to successful issues; whilst for the reasons stated, men who had taken up science as the business of their lives were placed at great comparative disadvantage. Votes of thanks to the president for his admirable address, to the Council of University College for their continued permission to meet in that building, and to the officers and committee for their services during the year brought the proceedings to a close. The result of the ballot for officers and committee for the ensuing year was as follows: President, Dr. T. Spencer Cobbold, F.R.S.; Vice-presidents, Professor Huxley, Dr. Matthews, Mr. Michael, Mr. C. Stewart; Treasurer, Mr. F. W. Gay; Hon. Sec., Mr. J. E. Ingpen; Hon. Foreign Sec., Dr. M. C. Cooke; to fill seven vacancies on the committee, Messrs. F. Coles, A. Cottam, E. Dadswell, J. W. Groves, J. W. Reed, J. C. Sigsworth, and T. C. White.

THE DIATOMACEÆ OF NEW FOREST.—Mr. Marquand in his interesting paper on the flora of the New Forest, alludes to the Diatomaceæ found in that neighbourhood; among others the pentagonal variety of *Amphitetrasantediluviana*. I do not quite understand whether he means that it occurs in or near the forest, or on the Hampshire coast; if the former it is very

remarkable, as, so far as I know, the genus is purely marine. I first detected it in a gathering from Hayling Island, and which I described and figured in SCIENCE-GOSSIP 1867, p. 271, as var. γ . Some years afterwards it occurred more plentifully in the stomach contents of *Ascidia* from Kirkwall; this form may be the same as Greville's *A. nobilis*, T. M. S. vol. xiii. p. 10, pl. 9, fig. 27. *Surirella elegans* (Ehr.) is by no means uncommon, and I have it from several English localities, and it is very frequently found in fresh-water gatherings from Scotland; it is also common in the Toome Bridge deposit. It is somewhat remarkable that Smith did not figure it in the "Synopsis," as I have it on a slide of his mounting, mixed with *S. biseriata*. I can only suppose he overlooked it. A very good figure of it is given in Schmidt's Atlas. *Surirella capronii* is, I believe, only a state of *S. splendida*, the presence or absence of a spine being of no specific value. My late friend M. de Brebisson sent me a gathering, in which *S. capronii* occurred with one spine only, and sometimes without, in which condition it was not distinguishable from *S. splendida*. Donkin's *S. subalpina*, Q. M. J. vol. ix. N.S. pl. 18. f. 2, is probably only a small state of *S. elegans*; this he remarks "bears a close resemblance to *S. limosa*, Bailey (Q. M. J. vol. vii. p. 179 pl. 9, f. 5)." This form is not *S. limosa* of Bailey, as Brightwell supposed, but *S. elegans*. I speak this with certainty, having seen the original specimen. *S. limosa*, Bailey = *S. cardinalis*, Kitton = *S. ovata*, Ehrenberg (not Kützing). —F. K.

HADERSHAW'S CATALOGUE OF THE DIATOMACEÆ.—Mr. F. Habirshaw, of New York, reproduced by the Edison electric pen fifty copies of his catalogue, which he generously distributed amongst the diatomists of Europe and America. This catalogue (with the sanction of the author) Dr. J. Pelletan, editor of the "Journal de Micrographie," proposes to publish in ordinary type, and for this purpose Mr. Habirshaw has corrected and rewritten the entire work. The proofs are to be revised by Mr. F. Kitton, of Norwich. The volume will be an 8vo., and is to appear in three parts, in intervals as short as possible. The subscription price is to be ten francs; the price after publication will be advanced to fifteen francs. This catalogue not only gives a list of genera and species, but references to the pages, plates and figures in the papers of the more important writers who may have written upon them; it also gives the synonymy as far as it is possible to do so.

THE AMERICAN QUARTERLY MICROSCOPICAL JOURNAL.—We regret to see an editorial announcement, that the existence of this journal ceases with the volume, the editor finding that it would be impossible for him to give the necessary supervision during the coming year.

ZOOLOGY.

REPETITIVE GENERIC NAMES.—A NEW FIELD OF WORK.—There are, I doubt not, many among your readers who, besides acquiring knowledge themselves, would be glad to assist in the general advance of science, but are deterred from attempting anything by diffidence as to their powers, and ignorance as to the direction in which they can best render service. To such I would point out that there is an immensity of work of the highest value to science, that only requires time, intelligence, and perseverance. For example, there are some 50,000 or 60,000 genera of animals (recent and fossil), a dictionary of the names of which, giving author, date, and class, is imperatively needed to prevent names now occupied being attached to new, and it may be widely separated, genera. The need of this may be shown by a few examples (I could fill an entire number of SCIENCE-GOSSIP with such):—

Aspis (Lawr.), 1768, Reptilia.

Aspis (Germ.), 18—, Coleoptera.

Aspis (Treitschke), 1829, Lepidoptera.

Axia (Hübner), 1816, Lepidoptera.

Axia (M. Edw.), 1837, Crustacea.

Axia (Eschsch.), 1825, Accephale.

Axia (Lour.) is a plant-genus belonging to the Valerianaceæ.

Lists of genera up to 1868 have been published; these require to be combined into a single alphabetical arrangement, and brought up to the present date, or, say 1880, inclusive. Funds for publication would doubtless be forthcoming when the time arrived. Any one willing to assist in the work of copying and arranging is hereby requested to communicate with *W. H. Dalton, H. M. Geological Survey, Weybread, Harleston.*

ESTABLISHING A ROOKERY.—In your July number, Mr. A. J. Robinson wishes to know how to establish a rookery. Without wishing to dishearten him, I fear he will find it rather a difficult problem. Two gentlemen in this neighbourhood tried all kinds of ways to induce the rooks to build, but without success. In one case nests were made in the trees, but the rooks still refused to come. The trees were also covered with netting, and the rooks fed and kept there; still there was no result. In the other case, the gentleman (a solicitor) tried all the means he could to induce the rooks to build, but in vain. He left the house some time afterwards, and the next tenant was a clergyman; then the rooks came at once and established a fine rookery which increases every year. If it is a likely place, Mr. Robinson and his friends might get some young rooks and tame them, and clip one wing to prevent them getting away—let them get well accustomed to the place and they might build the following season. I shall be glad to hear of any one having succeeded.—*J. Goodyear, Worsbrough, Barnsley.*

SIMULATION OF DEATH BY INSECTS.—Whatever may be the case amongst the Coleoptera and Arachnida, Mr. Slater's deductions, that the simulation of death is as a rule confined pretty much to those insects whose flight is weak and movements slow, will not hold good as regards the Lepidoptera. In no insect is the habit of feigning death more conspicuous than in that interesting little family of moths—the *Hepialidæ*, all of them characterised by a very rapid flight, and on account of which the English name of "swift" has been attached to them. I cannot agree with the writer of the paper to which Mr. Slater refers, that the practice of shamming death is not to be regarded as a stratagem to escape danger, all my observations tending to prove to my own mind that it is. I have frequently amused myself by catching numbers of swifts in order to watch their actions, and have from time to time taken all the five species commonly. There was no trouble in "boxing" them when once you had caught them, as their invariable habit is to adopt the "death dodge" and fall helplessly to the bottom of the net; but take them out and place in the palm of the hand, or put them into the chip box, and leave the lid off, and you will not have to wait many seconds before the little impostors are "off like a shot," laughing, perhaps like some begging human impostors afflicted with temporary lameness, blindness, and other maladies, at your credulity. All the *Hepialidæ* emit a peculiar odour which clings to the boxes in which they have been confined for some few minutes after they have been turned out; probably it acts as a further protection against certain foes.—*Joseph Anderson, Chichester.*

MIMICRY IN INSECTS.—The following case of protective mimicry in *Pyrameis Cardui* may be of interest to your readers. The paths of my garden are covered with fine shingle from the beach, and recently I noticed a number of painted lady butterflies (*Pyrameis Cardui*) hovering over one of the paths, occasionally settling on it. In order to notice them more closely, I moved up close to where I had seen one settle, but could not distinguish it until I almost trod on it, when it rose and flew a short distance, and again settled on the path with the wings closed, in which position, from the mottled underside of the wings so closely resembling the colour of the shingle, it was not easy to detect. After remaining quiet for a few minutes it slowly opened its wings, and then sat fanning itself after the fashion of the *Vanessidæ*.—*Charles Foran.*

ANCYLUS LACUSTRIS FLOATING.—The British *Ancyli* or fresh-water limpets do not as yet appear to have been seen floating, for Jeffreys, in his "British Conchology" mentions that they "have never been observed in a floating position" (vol. i. page 119). But I am able to assert that I have watched two, out of fourteen specimens, making their way in such a position on the under-surface of the water, with shell downwards, as is the case with other *Limnæadæ*.

These molluscs, which I procured last spring plentifully in an almost stagnant dyke near Lewes, Sussex, on the decayed leaves of *Iris pseudacorus*, are still thriving in my aquarium. This evening (July 22nd) I first noticed two of the ancyli floating, very slowly, but surely, making their way from one piece of duckweed to another; the greatest distance between the fronds of duckweed being about three-quarters of an inch in width. They appear to float in the same way as other Linnæadæ with the exception that every now and then they swayed from one side to the other the forepart of their bodies, apparently in quest of a frond nearer to them than the one in a direct line: they also continually opened and shut their mouths, and generally carried the hind of their shell closer to the tail, than the forepart to the head, so that the shell appeared to have an oblique direction. It was interesting to watch them as they progressed from one frond of duckweed to another, for sometimes on coming to two stems which proximated so closely as not to allow of a passage between them, the little creatures would cleverly turn their shell in a slanting position, and so manœuvre their onward course.—*S. S. Pearce.*

SPHINX PINASTRI.—I have just received a fine specimen of this very rare moth, taken on August 3, by Mr. A. W. Waller, in the gardens of Waldringfield rectory, on an Austrian pine. This makes the fourth specimen taken in the neighbourhood of Ipswich within the last three years.—*J. E. Taylor.*

BOTANY.

VIPER'S BUGLOSS (*Echium vulgare*).—Whilst walking on the South Downs, about a mile west of Shoreham, my attention was attracted by a mass of blue flowers growing in such luxuriance as to be visible at a considerable distance. On proceeding to the spot I found them to be the common viper's bugloss, which had spread themselves over about a quarter of an acre of land, and although there were no other of the same plants visible in the neighbourhood, yet at this particular spot there must have been several thousand plants, the flowery spike measuring from fifteen to eighteen inches in length. I may mention that *Echium vulgare* grows somewhat freely at a spot on the seashore some four miles distant, and I have occasionally met with it growing scantily on the Downs, but the plants have been usually much smaller. I thought its occurrence in such profusion is at least unusual in Sussex, and as such might deserve a note in the pages of SCIENCE-GOSSIP.—*T. Comlidge.*

VEGETABLE "COMMENSALISM."—The association of *Chlora perfoliata* and bee orchis is certainly frequent, although not invariable. During the present summer I have seen them growing together on the

cliffs near Beachy Head, and also a few days ago on the Chiltern Hills in South Beds. Last season I noticed them growing in company at another spot in the Chilterns, about two miles from the last-named locality. The bee orchis also occurs in a field at the base of the Chilterns near Barton, Beds, where it sometimes appears in great profusion; but the *Chlora* is never to be seen there, possibly because the field is occasionally mown. In this district (South Beds) *Geranium pratense* always grows associated with the stinging-nettle, and as I have never seen it, except in grazing fields, it occurred to me the latter prevented animals from browsing on the former. At any rate, the two grow in the closest companionship.—*J. Saunders, Luton.*

BERNARD HOBSON, Tapton Elms, Sheffield, will be glad to receive, not later than November 3, 1879, for publication, carefully arranged under respective counties, post-cards giving Christian and surname, full address, and subject of special study, of all persons (ladies included) who are willing to gratuitously assist in determining species, and otherwise personally helping with advice, &c.—or through the post, on receipt of two stamps for reply—all lovers, learners, or beginners of botany, zoology, geology, and microscopy.

THE "STUDENT'S CATALOGUE OF BRITISH PLANTS."—We have received a copy of this excellent pamphlet, compiled by the Rev. George Henslow, F.L.S., according to Hooker's "Student's Flora of British Islands." It is published by Bateman, High Street, Portland Town, London, at 1s. 6d., post-free.

WILD GEUM RIVALE RIVALLING CULTIVATED MONSTROSITIES.—Last July I gathered near Malham, Yorkshire, a most interesting specimen of *Geum rivale*. The plant was twenty-two inches in height; there were three stem leaves, the highest of which was situated three inches from the root-stock, and then the stem was naked up to the leafy calyx for seventeen inches. Instead of the usual drooping flower, there was an erect monstrous flower, the calyx segments of which had become transformed into petioled leaves, varying from an inch and a half to two inches in length; four of the bracteoles were also transformed into petioled leaves about eight or nine lines in length, the other was an ordinary large but double bracteole. Inside this monstrous calyx, there were about thirty petals fully twice the usual size, their prevailing colour being red; there were also about ten objects which were neither imperfect stamens nor petals, also one perfect stamen. Instead of the female part of the flower the axis was continued for an inch and then produced a perfect normal flower, save that one of its bracteoles was double, and it had the addition of another small calyx segment within the calyx. On this continued axis about three lines from its base were situated five

or six of the petals and imperfect stamens first described, though they evidently belonged to the forty petalled flower, as it would not have had a symmetrical appearance but for them. On this continued axis, about three lines from the base of the perfect normal flower was an imperfect flower containing two perfect stamens and one imperfect one, which were surrounded by about eight bodies, some of which resembled petals, others bracts, and others bracteoles. I may add that in the same district I saw about twenty specimens of *Gum intermedium*, some of which were near *urbanum* though more were nearer *rivale*; about half the number seemed to be exactly intermediate, on comparing all three in the field. I have often found *intermedium*, though only where both *rivale* and *urbanum* occur together.—*William West, Bradford.*

SINGULAR VARIETY OF HARTSTONGUE.—This excellent specimen was gathered by Mr. P. Thompson, at Milnthorpe. It shows the heteromorphic condition of some leaves, when placed in a position favourable to their growth. First, the midrib splits into two parts, then, instead of the ordinary

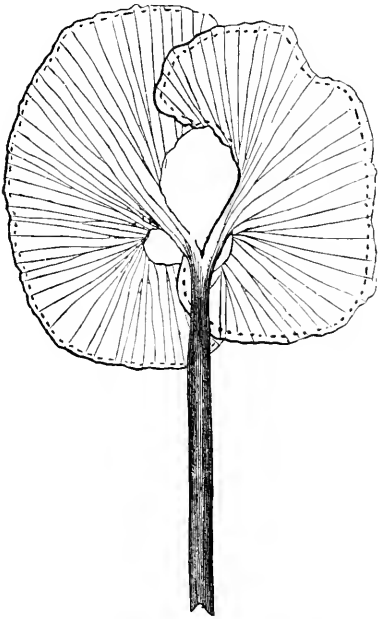


Fig. 165.—Peculiar variety of *Scolopendrium vulgare*.

bifurcated frond, we have the *Scolopendrium vulgare*, *perafro-cornutum* of Moore's "Nature Printed Ferns." This heteromorphic change is far from frequent; in the present state, we find it in the shape of horn-like projections, or to be better understood "pitchers," for example, the cuplike ending of the midrib, in the *Nepenthes*—arising, where it has prominent midribs, in the cohesion of the margin of the leaf. The example here figured is peculiar, because after being

partially joined, it again separates, with a flattened frond. Our correspondent does not state the condition of the remaining fronds in the plant, probably this was the only one found.

THE POWERS OF VEGETATION.—Trees have the power of adapting themselves to suit the locality in which they grow. Waterton tells us of a nut-tree which grew through the axle-hole of a millstone, which happened to be lying on the ground (some nut-eating animal had stored its nuts beneath the stone and one of them had escaped destruction). The tree increased in size till at length the trunk quite filled the hole. It could not then grow any thicker, owing to its millstone collar, and so it grew taller and raised the stone with it from the ground. I noticed the other day a Jasmine tree which was growing up one side of a brick wall. When, having become too large for the wall, it had no place on which to climb, it sent its branches in several places underneath the coping stone of the wall through holes, I suppose, made by the crumbling away of the mortar. These then grew down the wall on the other side, there being quite as much of the tree on this side as on the other.—*W. H. Cobb, Winchester College.*

GEOLOGY.

"AN ORNITHOSAURIAN FROM THE STONESFIELD SLATE."—This is the subject of a paper by Professor Seeley, in which the author described the characters presented by the impression of the skull of an Ornithosaur in a slab of Stonesfield slate from Kinton, near Stow-on-the-Wold, the peculiarities of which are such as to induce him to found for it a new genus, to which he thinks it probable that most, if not all, the known Stonesfield slate *Pterodactyles* may belong. It is distinguished especially by the great length of the roof of the skull posterior to the orbits, by the presence of a very deep constriction of the frontal region between the orbits, by the strongly marked sutures between the bones, and the curiously crocodilian character of the plan of structure of the roof of the skull, which suggests the existence of a lower grade of Ornithosaurian animals than has hitherto been suspected. The genus appears to be allied to some forms of *Rhamphorhynchus*. The author names the species, which is in the Oxford Museum, *Rhamphoccephalus Prestwichi*, and considers that the other bones of Ornithosauria discovered in the Stonesfield slate support the generic separation of the group.

LOCALITIES FOR FOSSIL STARFISH.—With reference to your wish that any information respecting the fossil starfish localities might be given you, I am happy to mention that I have found the feathery starfish (*Ophiocoma*) in the calc grit which lies immediately under the Kimmeridge clay situated between Sandsfoot Castle, near Weymouth, and the Portland ferry bridge.—*H. W. F., Weymouth.*

THE ANCIENT RIVER DEPOSIT OF THE AMAZON.—Mr. Barrington Brown has contributed a paper on this important subject to the Geological Society. The author described a series of alluvial deposits, varying in thickness from 10 to 160 feet, which have been cut through by the river, and form a series of cliffs, giving rise to striking and characteristic scenery. The succession of beds exposed in these cliffs was illustrated by a number of sections, and it was shown that the strata in question must have been deposited by river action. It was then pointed out that the river is performing two classes of work, namely, cutting away the older sheets of alluvial matter, and depositing the materials derived from them at a much lower level. The interesting phenomena of the cutting of curves by the river, and the abandonment by the river of parts of these curves, giving rise to the formation of lakes, was fully explained; and in conclusion the author showed by a map what vast areas in South America have thus been covered by these alluvial deposits.

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—Instinct may be described as a blind adaptation of means to ends; reason, as a conscious adaptation of means to ends. The principal features of instinctive actions may be enumerated as follows: They are performed in early life, are reflex and of much complexity, rhythmical, performed without any guidance from experience, they are executed in precisely the same manner by all the individuals of a species, they carry out a design which is formed *for* the animal operator *by* it, they are prompted by an organic sense of need, and are directly adapted thereto; and finally, they correspond with the *sensory motor* actions of man. Even in certain remarkable cases (as in the well-known instance of a pair of jackdaws erecting a cone of sticks six feet high as a support for their nest which had previously slid down several times from a sloping window-sill) where animals appear to have actually profited by experience, it has been considered that the business of mental analysis and abstraction is here performed *for* them, and that they do not here act with a *conscious* view to consequences. Some of your correspondents have asked whether the intelligence of animals differs from that of man in *kind*? If we consider intelligence as the faculty of knowledge, it is difficult to understand what is meant by different *kinds* of intelligence. We either know more or less about an object; but as for different kinds of knowledge (except it be the question of mediate and immediate, perceptive and comparative), that is a peculiarity not easily discernible. The simple question is, what faculties of knowledge do animals possess, and does man possess the same or different? No one seems to dispute that sense-perception and memory (as distinguished from reminiscence) and perhaps also a rough faculty of comparison are possessed by animals in a degree by no means lower than that of man. But as for voluntary reminiscence, imagination, the powers of abstraction and comparison involved in the formation of general notions, or in a complicated deductive or inductive reasoning process, and the various moral faculties, all of which men more or less possess, no one, not even the

mighty Darwin himself, has ascribed to animals. As we can judge of the animal mind only by its bodily actions, and as, consequently, it is only in reference to action that animals can be shown to possess reason, the only difficulty to be solved is, do animals possess ingenuity and conscious foresight sufficient to forestall their wants, and ingenuity and constructive skill sufficient to take the measures necessary for the supply of those wants? Now, there does not seem to be a shadow of evidence that they do possess such qualities. Their method of working without a trace of hesitation, confusion, or interruption, the circumstances under which they work, the identity of motive in almost every case—all unequivocally suggest the idea of an automaton mechanically operating, rather than that of a rational being working by the light of originally conceived aims and ends. Moreover, there are several well-authenticated instances of the irrationality of instinct (as in the case of a beaver building a dam where there was no water, &c.) which strongly tend to demonstrate the existence of a species of uncontrollable impulse on the part of the animal, that must (like a clock set a-going) as it were inevitably perform certain actions, no matter what the circumstances or the consequences may be. But besides acting with a conscious view to certain ends, animals may act from impulse, i.e., from strong special sensibilities inevitably directing as it were the native life-energy, which is always extremely vigorous amongst the lower animals. A powerful development of the *sensory motor* ganglia would amply account for this acting from impulse; and in fact, an anatomical demonstration of the brain of insects (in which instinct is most powerfully exhibited) exhibits this peculiarity in a very remarkable degree. Now, be it observed, that the *sensation* which produces this *motion* may be that of a mental image called up by the association of ideas; and this important fact will amply elucidate many of the instances of apparent reason or reasoning on the part of animals which have been adduced by some of your correspondents. For example, consider the case of the cat rapping at the door, and then scratching at the window in order to gain admittance to certain chambers. The cat knowing the two entrances, when one was closed up, the image of the other was immediately suggested by association, and this idea of the chamber window immediately operated upon pussy's legs, and caused the circumambulating movement described. There was no explicit or implicit reasoning process involved; the act was the result of pure impulse.—P. Q. Kegan, LL.D.

INTELLIGENCE IN MAN AND ANIMALS.—I have read with much interest the discussions in SCIENCE-GOSSIP upon this subject, and it appears to me that in this, as in most controversies, a very considerable amount of the difference between the adverse views expressed arises from the want of a definition at the commencement of the controversy of the subject of discussion. What do your correspondents mean by "reason"; and what by "instinct"? Is it not plain that instead of disputing about the same *thing*, they are in fact only disputing about the same *word*? If it were not discourteous, I would venture to submit that the whole discussion, so far as it has as yet gone, may be summarised thus: A. says, "I am convinced that brute animals do possess reason, because I mean by 'reason' something which brute animals show that they possess." B. says, "I maintain that brute animals do not possess reason. For I mean by 'reason' something that it is obvious that brute animals do not possess." Do not all the observed facts lead to this—that if by "reason" you mean the power of inferring

one proposition from another, then brute animals do possess reason? Thus, a horse has impressed upon his mind (whatever his mind may be) the proposition that "Inside this stable door I have found rest, and warmth, and food." And he infers from that, that by stopping at that door he will again find rest, and warmth, and food. But does not all observation lead us to conclude that here the inferential powers of brute animals stop, and that they are unable to follow out a train of reasoning, and, from one proposition known to them only by inference from another proposition, and not by direct sense, to infer a second and from that a third, and so on? And is not that the essential distinction between the inferential faculties, call them what you please, of brute animals and men? In other words, is it not the case that the highest efforts of brute animals in the way of inference reach only to *association of ideas*; whereas, in man, association of ideas, which is the foundation of induction, is the ground and starting-point of all the knowledge which he acquires by those long-continued trains of deductive inference which we call "reasoning?"—*C. B.*

INTELLIGENCE IN MAN AND ANIMALS.—Your correspondent, Mr. Barclay, writes in the June number: "They (animals) have also an innate dread of their enemies." Without intending to take a part in the discussion, I wish to relate one experiment that I made some time ago expressly to ascertain if the statement quoted was the fact or not. I had a young canary bird and bright young kitten. I brought the kitten into the room where the bird was on the floor, and placed the kitten also on the floor a few yards distant. They discovered each other at once, and the first symptom of each seemed to be curiosity and desire for more intimate acquaintance. Each commenced approaching the other. The bird advanced farthest fearlessly—no instinct of an enemy there; but as the bird moved, the instinct of the cat that there was prey was aroused, and the usual manifestation and passion of the cat tribe was shown. That alarmed the bird, and it at once retreated. This experiment proved that there was no innate dread of an enemy on the part of the bird; and on the part of the cat no anticipation of a good meal at first sight. The conclusions that each appeared to arrive at were "after thoughts," whether they are to be called instinct or reason. The two explanations of why rats gnaw leaden water pipes (page 140) are both improbable. It is a common trouble in this place, and the remedy is to substitute brass or iron pipes for lead. The true explanation most likely is, that when the temperature of the water in the pipe is below the dew point, water is condensed on the exterior of the pipe. Rats and mice need water, finding it there they try to get it, and their mouths and teeth not being adapted to lapping, the teeth cut into the soft material of the lead. That is all. They do not gnaw iron pipes, for the material is too hard.—*Charles Stodder, Boston, U. S.*

INTELLIGENCE IN ANIMALS.—I have a large smooth-coated dog, of no particular breed that I am aware of, which (I had almost written who), has a decided perception of Sunday from the other days of the week. To him the only difference is that on Sundays I am in the habit of taking him for a run after morning church. On each morning as I leave home for my business my dog sees me out, and when the door is shut he goes quietly and takes his customary morning nap; but on Sunday nothing of the sort takes place; he certainly sees me out, but not with the like composure; his features are anxious and expectant, and though quiet there is an evident latent excitement. No sooner is the

street door shut than he bounds upstairs to my bedroom and gets his fore feet and head out of the window and watches me out of sight, and no inducement can entice him from his vigils until my return. In the place of his morning sleep there is constant watching. Should his patience become exhausted he will make a rush to the street door, but this is apparently only as a diversion, for he is back again at once to the window, watching and waiting, at times giving way to distressed moans. And when he sights me on my return his frantic joy goes to the extreme of ecstasy. The mystery to me is how he can distinguish one day from the others. My movements at home on Sunday morning are similar to other days: I do not even make any perceptible change in my dress; I go down to breakfast in the same manner, and occupy about the same time at it; I return to my bed-room afterwards as on other days, and yet this dog knows one day from the others as well as I do. The only difference that I am aware of is that on Sunday I do not rise so early, but as the whole of my household observe a similar indulgence the same order of events is preserved. As there is cooking going on in the kitchen, the dog has been given to understand that he is not wanted there at such times, and on two or three occasions after our Sunday's ramble, he has been kept waiting on the door steps while the kitchen door was shut; he now waits without any reminder, whatever the weather may be, and he makes no attempt to enter the house until he is bid, and neither will he attempt, as a rule, to go into the kitchen until the cooking is over. But I am bound to say that I do not claim for him a higher degree of rectitude than belongs to the ordinary run of the "superior animal," and I am not certain that the savoury smell from the lower apartments would not be a strong inducement to disobey orders if a little watch were not kept over him. However, there is in him the certain knowledge of good and evil, for when he is detected in an attempt to infringe the rule, which, to give him his due, is very seldom, he exhibits certain evidences of a guilty conscience and profound penitence, unless the subdued look and dropped ears are but the veriest hypocrisy; but we soon forgive him, being well aware of his infirmity for tasty morsels. I may observe that when I take my friend for a run on other days than Sundays, which is of rare occurrence, he adheres to the rule of waiting at the door until told to enter the house, but this is observed only in the early part of the day, as on the evening of *all* days he does not wait for any bidding.—*J. R. Hayes, Barnsbury.*

INTELLIGENCE IN SEA-GULLS.—Perhaps some of your readers may be interested in the following incident. For the last four years we have kept a pair of herring gulls, which we have allowed to roam about the garden fields. The other day, as some little chickens were going to be led out into the field, it was necessary to shut the gulls up, of which they are very fond; so they were put into the fowls' yard; upon which one of them (the male) began to chase the fowls, and at length succeeded in securing them in a corner of the yard, then all of a sudden he made a dart right into the midst of them; scattering them right and left, after which he chased the cock round the yard, and then repeated his chase amongst the fowls; but still he was not satisfied till he had driven every one of them into the hen-house (at 3.30 p. m.), where they stayed for the rest of the afternoon. Probably the sea-gulls did not approve of being shut out from the garden, so they thought they would make the best of it by having the yard all to themselves.—*Horace Livens, W. Croydon.*

THE SAGACITY OF A THRUSH (A CAGE-BIRD).—My interest in this bird has been roused within the last day or two, and it may interest some of your readers if I describe the facts which have come under my notice. My attention was called by the owner of the thrush, who had received from a boy a nest of five young thrushes, which were put into the cage with the old pet, nest and all. Worms were thrown into the cage for the old bird, upon which an attack was made as usual, and after breaking them in pieces it began to feed the young ones, as if they were its own family. Now, considering that this bird has never been at liberty, it appears to me that a most wonderful amount of sagacity has been shown by this act, and it is clearly instinct and sagacity, and not practical experience, which has taught the bird how to look after and tend upon the thrushlings. And surely in this act is reflected the care of the Provider, the Maker, and the Guider of all. I should be glad to know if any of your readers have ever noticed this act before on the part of a cage-bird.—*A. H. Hulley.*

SAGACITY OF A CAT.—We have a very interesting cat at home. She is a fine Angora and a capital mouser, though now getting rather old for such work. In her earlier days she would go anywhere after a mouse. I remember that once she ran up the curtain and caught a mouse at the top, and another time she rushed up the chimney while a red-hot fire was in the grate and returned with a mouse, covered with soot; where the mouse was caught I cannot say, but it is perfectly true that the cat went up the chimney. It is not, however, of her mousing exploits that I wish now to speak. She grew very fond of a housemaid who was with us when first she came, and used to follow her all over the house. Whenever the cat caught a mouse or a bird she would, before she ate it, lay it down at the housemaid's feet. If the maid took it away, she never attempted to get it again and eat it, but let it lie there. As the housemaid always threw the birds away it stopped her from catching them, but afterwards when the housemaid left she again took to her old habits, and we missed many birds out of their aviary, finding their feathers alone stuck in the bars; the cat must have pulled the birds through the wires, which are only a quarter of an inch apart. When the housemaid left us the cat also disappeared for some weeks, and when she did come back, moped about in the garden all day, for a long time. When the house was painted the cat went away till the men had left, when she immediately returned and now sits almost all day before the kitchen fire.—*F. A. Bather, Roehampton.*

FLIES AND PEDESTRIANS.—Can any of your contributors suggest a remedy against being followed, for miles I may say, by a troop of flies, who, taking advantage of the warm summer atmosphere, attach themselves more particularly to the head of the pedestrian, and cause much annoyance by settling upon the face, neck, ears, &c.? I am under the impression that the leaves of a particular tree or shrub, rubbed upon the face of the clothes and hat, act as a preventive, and I think that this fact was conveyed in a former number of SCIENCE-GOSSIP. Probably the circumstance alluded to will bear repetition.—*W. W. Ingall.*

SLOW WORM.—In answer to W. G. T.'s question in last month's SCIENCE-GOSSIP as to the reddish-purple variety mentioned by Mr. E. D. Marquand, I have had four of this colour among a dozen sent from Yorkshire. They were about ten inches long, and of a bright copper colour, with black lines running down the sides from head to tail. I have seen some scores of slow worms, but have only noticed these four.

I have now a slow worm measuring eighteen inches long, which is rather an unusual length for this reptile. They will live a long time in an ordinary fern case, and may be fed on white slugs, which they seem to prefer before anything else; a small pot of water should be placed in the case with them, as they are rather thirsty souls, immersing nearly the whole of the head while drinking. They are altogether very interesting to keep.—*G. Currie.*

ROBERT MUDIE.—Is there any biographical account of this pleasing writer? His work, the "British Naturalist," delighted the world sixty years ago. His "Feathered Tribes of Great Britain," "Guide to the Observations of Nature," "Seasons," "The Earth," &c., did much to promote the study of natural history. He was a man for an age not for all time; but we have attained to our present advanced state of general interest in the grand operations of Nature, because Mudie and others like him well lived and wrote. Perhaps some of your readers can supply an article on this matter.—*Robert B. Botwell, King's Langley, Herts.*

PALM IN FULL BLOOM.—We have on our lawn a dwarf palm, which will shortly be in full bloom, and thinking it unusual to see such in England, I write to ask if you or any of your readers know of another. The plant is about seven years' growth, and has never been protected by any covering during the winter. Last year it bore four spathes of bloom, and this year six. Our gardener has given me the following dimensions of the plant: "Height of plant, 5 feet 4 inches; width, 6 feet 8 inches; circumference, 20 feet; height of trunk, 2 feet 10 inches; circumference of trunk at base, 2 feet 10 inches." It may interest your readers to know we have also a Paulownia which has blossomed several times, and some seed ripened from which we have raised a fine young tree. We have too a plant of *Phormium tenax*, which the year before last had two flower spikes, one being nine, the other ten feet high, which bore respectively 22 and 28 seed pods, which ripened; and we have now some young plants raised from them and growing nicely.—*E. D., East Cosham, Hants.*

CAN WORMS CRAWL BACKWARDS?—Having read the Rev. J. G. Wood's statement that "it is impossible for the common earthworm to crawl backwards," and also Mr. W. Budden's note thereon in the May number of SCIENCE-GOSSIP, I was induced the other evening to experiment with a large worm in the garden. It was proceeding along the path at a quick rate, when I interrupted it by giving it several gentle taps on the head with a small stick. At first it seemed inclined to push on, but after repeated taps from the stick it suddenly began to move backwards, and continued to pursue its way in this manner until it got out of sight. This incident confirms Mr. Budden's statement, that "worms can and do crawl backwards."—*G. O. Howell, Shooter's Hill.*

WORMS CRAWLING BACKWARDS.—I can readily confirm the statement of your correspondent, W. Budden, that worms can and do crawl backwards; especially when, as he describes, they are touched on the head by a small stick or any other substance. Only a day or two since I saw two worms crawling on the wet road, and by gently touching the head of one it began to alter its course, with its head, to one side, I again touched it and it immediately began crawling backwards. The other one I wanted to get to crawl on a piece of writing paper, but whichever way I presented the paper to it, it would endeavour to avoid it and crawl the reverse way.—*J. G. B., Wrotham, Kent.*

SPARROW-HAWK'S NEST AND EGGS.—On the 8th of May last I found a sparrow-hawk's nest in a small fir-tree, containing one egg only. As I very much wanted a good specimen, and yet did not wish the birds to forsake their nest, as they would in all probability have done had I left it empty, I took the one egg and left in its place a blown one of the same sort, which was rather an indifferent specimen. On the 10th I again visited the nest; the old bird flew from it, but it contained only the blown egg I had left. On the 13th I went again to see it, and found two fresh eggs laid, and the blown one thrown from the nest on the ground below. Thus for two days following the day on which the first egg was laid no other was produced, and during the next three days two only were laid. This seems directly opposite to the opinion held by the best authorities, that the eggs follow each other day after day, and that when they are matured it is beyond the power of the bird to abstain from laying them. Could any one explain these apparent difficulties?—*T. L. S.*

PLATES OF BIRD'S EGGS.—Since replying to a question in *SCIENCE-GOSSIP* a few days ago relative to diagrams of birds' eggs, I have ascertained that Messrs. Hachette and Co., the French publishers, of King William Street, Strand, will undertake to procure these or any other diagrams of the series to order. If you think it worth while to append this information to my former note, please do so at your discretion. I have many of the series; can furnish lists of the whole if required.—*Richard Lewis.*

CUCKOO'S EGGS.—Your correspondent F. Anderson, in the June number, remarks on the rareness of the cuckoo's egg being found in nests, on, or near the ground. A friend of mine found the egg of the cuckoo in a skylark's nest, and in the grey wagtail's. —*E. V. Seebohm, Barnes, S.W.*

EXTRAORDINARY SITUATION FOR A THRUSH'S NEST.—On the outside wall of a beer-shop called the "Gladstone Arms," in the town of Wrotham, directly under the sign-board, over the front door, a thrush has built her nest, and is now sitting quite closed; the nest is only about two or three feet from persons' heads as they enter the door, and slightly screened by a few branches of a monthly rose and tea-trees. The landlord is very proud of his neighbour, and affords her every protection as a reward for the confidence she has placed in him.—*J. G. B., Wrotham, Kent.*

REMOVING SHELLS FROM BROOD.—Can any of your readers inform me how most birds so effectually remove the shells of their eggs when their brood is hatched, and what they do with them?—*J. M. W.*

QUERY AS TO NEST.—In the early part of June, 1878, I was botanising in Berkshire, when I accidentally discovered a bird's nest, and being unable to find what it might be, I thought some of *SCIENCE-GOSSIP* readers might be able to tell me. The nest was built in a tall bramble-bush, about four feet from the ground, composed of twigs, with a lining of hair. The size was about that of a greenfinch's, but there was scarcely any cavity for the eggs, which were five in number, and exactly the size of the house-swallow's; they were a pure white, but thickly spotted at the large end only with red. The bird was sitting on the eggs, and as far as I could see closely resembled a whitethroat. The locality was a piece of waste ground close to a large pond, and on the borders of a wood.—*Junior.*

CURIOUS SITES FOR BIRDS' NESTS.—Remarks by "G. T." at page 141 recall doubts formerly often felt, and since revived at intervals, as to who might have been the original architect of some particular nest. Being again reminded of the subject, and without reliable book, readily accessible, to tell what really distinguishes the home of hawk, magpie, jay, crow, or wood-pigeon, I am under the impression the nest of the latter is flat and smaller in proportion to size of owner; one found, seven or nine feet up in underwood, was a mere plate of wicker-work. The plump featherless spinous squabs, with disproportionate beak and head and distended crop, were passed down, panting and palpitating, to close their eyes and die, as my young fellow-marauder asserted, from the heat of our hands and of fright. Other nests referred to are often protected by the fork of a stout limb, or are placed in an outer fringe of twigs incapable of supporting the lightest climber, yet so matted and interlaced as, together with the height and structure, to afford considerable immunity from missiles. Those who have clambered and closely observed, may be aware of differences in arrangement and construction that I should be glad to be made acquainted with. From the ground the nests seem to be much alike: those of crows and hawks being perhaps more roughly put together and made of thicker materials, whilst the nests of magpies and jays are somewhat better finished, deeper and of slighter and more pliant sticks. The strong straight beaks and the feet of the two last-named genera are, no doubt, handier tools for nest-making than the corresponding members of hawks. When the former birds were more abundant, they were bold, establishing themselves near the haunts of man, whilst wild pigeons and wary hawks sought the deeper and more secluded recesses of woods. A crow occupied an oak at the verge of a spinney close to a poultry wife's back door. It overshadowed the recreation-ground of her feathered charges. A small cluster of oaks, enclosed between thick double hedges, with tall fir-trees, formed the termination of a pleasure-garden and orchard, and separated the crow's oak and spinney from a kitchen-garden flanked by another and larger copse on the far side. A pair of jays located themselves in a huge tree overhanging the kitchen-garden with its prospective currants and rows of green peas. A hundred yards farther within the copse and the same distance from young poultry and laying hens, a magpie selected an oak placed almost singly where the underwood was cut. Beyond where this remained untouched, a hawk built on a similar tree, tall, of moderate size, and without branches below a spreading head. The birds mentioned oppose appropriate cunning to the evil intentions of numerous enemies. A concealed, or open watcher may wait in vain for hours expecting ingress or egress; sticks and stones are hurled, and shouting tried without result to dislodge the occupant of an almost bullet-proof citadel, yet, when, for an instant, vigilance relaxes or patience wanes, the artful bird drops, like a stone, perpendicularly to the earth; almost brushing the face and breast of the stalker it dives through the long grass and fern to be immediately lost to sight; or, possibly, turning away for a moment, on looking back we see her slipping off noiselessly on the other side, passing behind a faggot pile or through the shelter of intervening trees, and thus getting quickly out of range. Few birds are more sly than the perky jay, hopping from bough to bough, jerking its long tail; crest and buff coat and blue and black barrings of wing glistening in early sunlight. 'Twere as easy to "lure the wild vulture from the heavens" as get him in hand, but if the parents be killed, fliers continue to hover about or soon fall

victims to the old gardener or keeper—thus somewhat discrediting the theory that impressions strongly implanted on the brain of a parent are transmitted; so as to act without supplementary teaching—the instinct of swallows for example.—*F. F.*

TEA STAINS.—If a strong decoction of tea is added to a solution of iron sulphate, a black coloration is immediately given. It is formed owing to the action of an organic astringent acid present in tea, and is very analogous to the formation of ink, by mixing together tincture of galls, and sulphate of iron. Attempts have been made to utilise spent tea-leaves for a like purpose.—*C. J. W.*

TEA STAINS.—Dry tea-leaves contain from thirteen to eighteen per cent. of an astringent principle, which is a modification of tannin. This, in contact with iron, produces a blackish-blue precipitate, in fact, a kind of ink.—*W. M. Holmes.*

TEA STAINS.—Most teas contain tannic acid in greater or less quantity, and when tannic acid comes in contact with steel, tannate of iron is formed, which is of a bluish-black colour. Tannate of iron is of course the colouring material of ordinary black ink. R. N. B. will find ample information on tannic acid in any work on organic chemistry.—*Rev. S. D. Tiltman, Godalming.*

UNDER WHAT CIRCUMSTANCES IS THE YEW POISONOUS TO HORSES AND COWS?—Youatt states in his work on "Cattle" on the authority of M. Husard, that "in Hanover and Hesse cattle are partly fed upon leaves of the yew. The quantity of yew is small at first, but it is gradually increased until it constitutes the greater part of the food. The inhabitants of Hanover and Hesse are nevertheless perfectly aware of the poisonous properties of the leaves of this tree, and are sometimes taught, by dear experience, that it will destroy their cattle, unless it is managed with this degree of caution." The poisonous properties are due to a substance called "taxine," which has not yet, as far as I am aware, been thoroughly examined. Most authorities have agreed that yew leaves in all conditions are poisonous both to man and cattle; and it would not be difficult to furnish overwhelming proof of this. Is your correspondent J. H. G. quite sure that the van-horses ate any of the yew from the garden? If not, the fact that they have never suffered, may be easily accounted for.—*W. M. Holmes.*

COSSUS AT SUGAR.—With reference to this subject I may mention a similar instance of this insect coming to sugar some two seasons ago; when going on to the field rather later than usual, and not considering it a good locality, I put the mixture on rather sparingly, so this individual must have been possessed of very keen senses. It was a fine female, and came on at about dusk, almost before anything else. Is there any satisfactory reason why the Nocturni so seldom seem attracted by the sugar? If any of your correspondents could suggest such, I should be glad to receive the information.—*A. Horsley Hinton.*

COSSUS ON SUGAR.—While sugaring with a friend in Highgate Woods in the summer of 1876, I was surprised to find a fine male specimen of cossus, seated on the higher part of the "sugar streak," evidently enjoying his unexpected luxury. My friend succeeded in capturing him, and now has him in his collection. On mentioning this capture to another entomologist in the wood, I was told that they are to be caught by sugaring on the willows on the banks of the Lea in Essex.—*J. O. B.*

LEAVES OF RHUBARB.—I learn from H. G. Glasspoole's interesting paper on "The History of Rhubarb," that the leaves of that plant were formerly eaten as a vegetable. Will one of the readers of SCIENCE-GOSSIP kindly tell me of a good mode of preparing and cooking them as such?—*A. M. P.*

NOTES OF FROGS.—We have been passing the winter at Biarritz, and often in our walks in the neighbourhood we have heard a noise like the tinkling of many sheep bells. This noise, some people told us, was produced by a toad, and others by a frog; as both these reptiles abounded in the hedges, it was difficult to ascertain from which the noise really proceeded. Can any reader of the SCIENCE-GOSSIP inform us if the pretty, cheerful sound was made by a frog, or a toad, and how the noise was produced?—*V. G.*

INDIGENOUS MEDICINAL PLANTS.—I should be grateful for any information regarding localities of the Indigenous Medicinal Plants, in the ancient district Cumbria; for identification only, none will be removed.—*J. Foster.*

STOCK-ICE.—In SCIENCE-GOSSIP for June a correspondent states that in certain frosts the bottom of streams and "broads" in Norfolk will freeze, and at the giving of the frost a substance something like ice-cream in appearance will come to the surface, to which the local name of "Stock-Ice" is given. During a severe winter which I spent many years ago in Germany, I observed the phenomenon of water beginning to freeze at the bottom instead of the top—this occurred in one of the mountain-streams flowing into the Neckar. I have not witnessed it since, nor have I met with any explanation or mention of it, but I thought at the time, and have since assumed, that I had hit upon the true solution. Water, when in a state of agitation, does not freeze so readily as when it is still. The stream at its surface was in rapid motion, but at the bottom there were recesses where the water was nearly, if not entirely quiescent. Here, as the temperature of all the water, and the containing channel was far below the freezing-point, crystallisation was able to begin. The process was possibly assisted by the presence of objects serving as a nucleus, but I did not observe this, nor am I aware whether the formation of ice is promoted by such means, but the ice remained at the bottom in flocculent masses, and may have been attached to the channel by something round which it had formed. I should add that lower down the valley an overshot mill was completely draped with curtains of icicle, which had accumulated till the wheel was completely stopped. It may be said that there the water, though in motion, had frozen. I imagine, however, that where water is already below 32° Fahr., and is only kept from freezing by motion, some very slight change of conditions is sufficient to turn the scale and to cause the process of crystallisation to set in. I shall be glad if some of your scientific readers will give their views on the facts stated, and my suggested explanation of them.—*J. Hennen, Offham, Leves.*

DUTCH CLOVER.—In our neighbourhood, Clevedon, Somerset, I find this year an abundance of the Dutch clover (*T. repens*), with flower heads in various stages of transformation or reversion to leaves. The petals, and sometimes the carpels, are quite green and trifoliate shaped, exactly like miniature specimens of the ordinary leaves. *Trifolium hybridum* shows the same tendency to monstrous growth this year. The excessive rainfall is suggested as a cause.—*W. E. Green.*

ARUM MACULATUM.—A little girl, six years of age, died this week in the neighbourhood of Liss, from the effects produced by eating the spadix of the arum. The child's mother was working in a hop field, and took the little girl to help her, as she expressed it, "out of harm." The child went to pick wild flowers, and finding some "lords and ladies" ate several. She became ill, and after lingering for some days died in great agony, medical aid not having (I believe) been sought. I did not hear of the case until after the little poor sufferer's death, and then it was only incidentally mentioned, that "a child had died from eating arum flowers." Country people are so sadly ignorant of the poisonous properties of our native wild plants, that I am surprised more deaths do not occur.—*Mrs. Alfred Watney.*

NATTERJACK TOAD.—In reply to Mr. Perrycap's query, I found the natterjack quite an interesting pet and easily kept. I had him in a small fern case, in a corner of which he took up his abode, scratching a hole in the soil, in which he sat with his bright eyes on the look-out for any insect or worm thrown to him. When a worm was given to him he stood over it much like a terrier over a rat, and with a snap soon made an end of lumbricus. If the worm was large and struggled violently, he assisted it into his mouth with his *hands* (or hand, as he had at an early age lost one). Insects he generally caught by a rapid stroke of the tongue, but he declined any that were dead; in the winter, when insect food was scarce, I fed him on little pieces of raw meat, which he readily took if they were gently moved as if endowed with life. When in the possession of his former owner he once made a meal of a young snake, eight inches long (see SCIENCE-GOSSIP for 1873, page 93). He was also fond of a bath, and would sit for hours at a time in a little pan of water placed in the case beside him. He got so tame that he would come to my hand, into which he would crawl to be taken for an airing through the house, catching the flies from off the walls. Last year "Diabolus" (a name given him by a lady friend of mine) did not seem so lively after his winter nap, and his tongue seemed to have lost its cunning, and he with difficulty took any food, till one morning I found him dead in his corner. He was about ten years in confinement, and probably died of old age. If Mr. Perrycap wishes any further information I shall be glad to give it if he sends me his address.—*J. M. Campbell.*

BOOKS ON BOTANY.—In the article on "Books on Botany" in the August issue I find two mistakes. According to the latest catalogues that I have seen, the two volumes in Collins's Advanced Series by Prof. Balfour are not yet published, and the translation of Le Maout and Decaisne is 3*rs.* 6*d.* not 5*s.* 6*d.* Thorne's "Botany," also, is not a book on a special branch, but a general text-book, though not on the usual plan. I think the idea of lists of suitable books for students a good one. Brief lists, more compressed on account of space, might guide students in their choice.—*A. Wheatley.*

REGISTER OF WORKING FIELD BOTANISTS.—It has often occurred to me what a useful thing would be a register of working field botanists, similar to that of entomologists, published some years ago by Mr. Stainton. There must be in every place at least one working botanist who would be glad to place his name on such a register as willing to help strangers by affording information as to the local flora. I have just again been reminded of this by a botanical visitor to this town, whose acquaintance, to our mutual regret, I only made a day or two before he left. Had there been such a register, we might have had many

pleasant rambles together. If I might suggest such a thing, I should think a list, alphabetically arranged as to towns, and published annually, say as a supplement to SCIENCE-GOSSIP, and for which some small fee could be charged, would meet what is required.—*Arthur D. Melvin.*

ROBBERIES OF KESTRELS.—Many readers of SCIENCE-GOSSIP must lately have noticed a series of letters in the newspapers in which the amount of good and evil done by our birds of prey is made the object of discussion. Much of the correspondence consists of examinations into the kestrel's claims to a good character, and it must be confessed that the bird has not come out of the affair quite so honourably as we would have wished. It is certainly ungracious in the kestrel, while his friends are defending his reputation for good behaviour, to frustrate their kind endeavours by carrying off young chickens and pheasants to his nest, where the remains must be discovered by the first unfeathered biped who chooses to pay him a domiciliary visit. But the reports of these discoveries in the *Standard* are only too conclusive, even if we had not evidence nearer home. In this neighbourhood many chickens lately disappeared. A hawk's nest close at hand, being fired into on suspicion, was brought bodily to the ground, and proved to contain two young kestrels and a dead chicken. This is only a unit added to the list of misdemeanours decisively "brought home" to the kestrel during the present season. Unusual events have not been scarce this summer, and in few cases have attempts been made to account for them, somehow or other, by the "lateness of the season." It is worth inquiring whether the windhover may not fairly claim this excuse for his singular violation of the trust which naturalists have always placed in him. The fieldmouse being the staple food of the kestrels, it is presumably the chief diet in ordinary seasons of the young birds in the nest, and as the cornfields are the usual habitat of this animal, it must be on these that the young kestrels depend in great measure for their subsistence. In this county (Wexford) where the bird is very common, I have observed that it seems to take complete possession of the fields as soon as they are reaped, scarcely a stubble being not daily visited by it. It then presents a noble contrast to the sparrow-hawk, which hardly ever shows himself in such localities. When the young kestrels are fledged, which does not take place till the harvest has made considerable progress, the families repair *en masse* to the stubbles, and must then do an incalculable amount of good. But this year the bird is in a predicament. The young are in the nest, and must be fed; but though August has begun, the corn scarcely shows signs of ripening, and reaping is as yet out of the question. Even the sharp eye of the kestrel is unable to detect its prey among the green waving fields of oats and barley, which everywhere greet the eye, and it is not wonderful after all that it should turn elsewhere to seek its food. In such a state of things it occurs to me that our friend must be even a worse depredator than that notorious robber the sparrow-hawk. For the mouse-hunting instinct of the former teaches it to seek its prey only on the ground, and thus, in the absence of mice, the number of pheasants, partridges, and chickens, which fall into its grasp, would probably be much greater than would be carried off by the sparrow-hawk, which seizes its victims indiscriminately from the ground or from the branches of trees, and often chases them on the wing for considerable distances. If these conjectures are right, the general character of *Tinnunculus* remains unimpaired, and only for the present summer can he be considered a public enemy.—*C. B. M.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

H. H. (W. Ashling).—Your mint is a form of *M. arvensis*; it approaches *M. agrastis* very closely. The other is *Calamintha sylvestica*, it is too diffuse for *C. menthifolia*.

M. M. C. C. S. (Somerset).—The specimen you enclose is the snowberry (*Symphoricarpos racemosa*), a North American shrub, not uncommon in cottage gardens. We have no doubt whatever it is the plant called snowdrop tree by your Welsh correspondent; we have heard it named snowball, snowdrop, and snowberry.

J. G. G. (Chipperfield).—We have done our best by microscopical examination, to find out the cause of the discoloration; the cells are devoid of chlorophyll, still the leaf is uninjured, and has evidently not suffered either from insect or fungoid growth.

C. VANCE SMITH.—You can get living marine zoophytes, &c., from Mr. T. McGann, Gortaclear, Burren, Ireland; and weekly supplies of living microscopical animals from the excellent studio of Mr. Thomas Bolton, 17 Ann Street, Birmingham. Many thanks for your beautiful slides.

JOHN PLATT (Nantwich).—We have received the shell you say was one of several which came from a girl's ear. It is the upper part of an empty *clausilia*—a common shell on hedgebanks and moss. The girl must have been lying on the grass, or else have put the shells in her ear, as children often do put such things. It is utterly impossible the shells could have lived in the girl's head, and they certainly had not been in her ears long before they came out.

E. D. BAYLEY.—Thanks for your specimen of rose in which two buds are growing together by their calyxes.

J. A. W.—Lindsay's "British Lichens," published by Routledge, at 7s. 6d., with coloured plates, is a good introductory book.

W. PURVES (Callander).—See articles on "The Preparation of Insects for Microscopical Examination," in SCIENCE-GOSSIP for May and June of the present year. Also chapter in "Collecting and Preserving Natural History Objects," published by D. Bogue, 3 St. Martin's Square, London, price 3s. 6d.

R. A. BUTLER.—The "crystalline cases" attached to seaweeds, are the egg-cases of some molluscs, perhaps of a species of *Natica*. The "growth" attached to underside of walnut leaf are the stalked eggs of some insect. In many respects they resemble those of the lace-wing.

H. H. BROWNE.—We have not as yet received any box containing the wild flower you mention.

W. K. (Leeds).—We sent off your specimens to a gentleman to be named, and he has unfortunately mislaid them. Please send us others.

J. W. WILSON.—You will find details of the genus *acarus*, in Boisduval's "L'Entomologie Horticole," also a good synopsis in the "Micrographic Dictionary." Westwood's "Entomologist's Text-Book," will supply you with details of the genus *Atropos*. S. BOXFORD.—See note on "Reptile Vivaria" in SCIENCE-GOSSIP for 1878, page 38; also details as to reptiles in confinement, in SCIENCE-GOSSIP, vol. iv. page 272. A description of a "Reptile Vivarium" is contained in SCIENCE-GOSSIP for 1876, page 266.

EXCHANGES.

WANTED, a little sand or dredgings containing globigerina. A liberal exchange in double-stained vegetable tissues in return.—Charles Vance Smith, Carmarthen.

WANTED, well-mounted slides (dry) of all the Pleurosigmata, in exchange for physiological and others. Lists to M. Fowler, Burn Row, Slamannan, N.B.

A GOOD triple nosepiece and a pair of stage forceps, in exchange for a really good one inch and a fair quarter inch objective.—T. S. Harrison, The Laboratory, 31 Scale Lane, Hull.

FOR mounted slides of *Podura curvicaulis* or *Degeiria*; send other slides of interest.—T. Forty, Buckingham.

THREE and a half volumes of the "Intellectual Observer,"

unbound, and all the Lepidoptera I take this year for fossils or books.—J. A. Floyd, Alcester, Warwickshire.

WANTED, microscopic apparatus or books, for a complete set of "Grevillea."—C. Weeks, Torquay.

TEETH, cartilage, &c. (unmounted), from Slamannan coal measures, make good slides, showing structure, for other unmounted material. Send lists to M. Fowler, Burn Row, Slamannan, N.B.

LAND and fresh-water shells, taken in Yorkshire for those of other counties. Address, H. Pollard, Philosophical Hall, Leeds. Fine specimens of *Batis*, *Dersa*, *Diluta*, *Hepatica*, *Brunnea*, *Nebulosa*, *Ziczac*, *Jota*, *Albicillata*, and others. Wanted good British eggs, or marine shells.—Thomas H. Hedworth, Dunston, Gateshead.

SILURIAN corals and brachiopods, good specimens named and unnamed, in exchange for other fossils.—F. Ashton, 46 Lingard Street, Moss Side, Manchester.

WANTED, the "Gamekeeper at Home," by the author of "Wild Life in a Southern County," in exchange for Hayward's "Botanist's Pocket-book."—Indus Villa, Livingstone Road, Havelock Park, Southsea, Hants.

SLIDES of *Phthirus pubis* (human crab louse), in exchange for other parasites. Send lists to A. W. Stokes, Laboratory, Guy's Hospital, S.E.

WANTED, 46, 103, 119, 170b, 511, 559b, 678b, 730, 757c, 828, 933, 992b, 1057b, 1081, 1139b, 1222, 1227b, 1228, 1266, 1279, 1286, 1298, 1347, 1410, 1457, 1582b, 1669, 1670, 1671, 1673, 1674, and 1678, for *Potamogeton Zizii*, M and K.—Andrew Brotherston, Sheddin Park Road, Kelso, N.B.

LARVÆ of *Bucephala*, *Filipendula*, *Salicis*, and *Chrysorrheea*, also British plants for larvæ and pupæ.—Tunley, 7 Albert Road, Southsea.

WANTED, Kentish books, deeds, and guides—or rubbings of monumental brasses, from any county. Exchange natural objects, fossils, ferns, seaweeds, &c.—F. Stanley, Margate.

"NATURE," complete, 19 volumes, beautifully half-bound, rest of numbers up to date, in exchange for binocular microscope. Address, Alfred Tozer, Jackson Row, Manchester.

WANTED, for a consideration, live reptiles, British or Foreign.—J. M. Campbell, Kelvin Grove Park, Glasgow.

FINE collection of well-preserved U. S. plants, about 1000 species, including grasses and ferns. Wanted, works on Entomology, botany (specially cryptogamic), or others.—Address, care of Editor.

WANTED, good micro material, prepared or in the rough—Foraminifera, Polycystina, Spicula, Diatoms, E. spines, &c., for first-class slides.—James Green, the Cross, March.

HORNETS AND WASPS (living ones preferred) wanted in exchange for first-rate insect preparations. Please write, before sending any insects, to E. S., 24 Grummant Road, Peckham, S.E.

S. LACUSTRE, *P. nitidum*, *P. fusillum*, *N. fluvialis*, *L. glabra*, *P. involutus*, *L. involutus*, and other shells, in exchange for numerous desiderata.—Henry Laver, F.L.S., 1 Trinity Street, Colchester.

BOOKS, ETC., RECEIVED.

"Smithsonian Report, 1877." Washington: Government Printing Office.

"Wild Flowers worth Notice" (new edition). By Mrs. Lankester. London: D. Bogue.

"Manual of Bee Keeping." By John Hunter (3rd edition). London: D. Bogue.

"Greenhouse Favourites." Part iii. London: Groombridge.

"Proceedings of Liverpool Naturalists' Field Club, 1878-9." "Journal of Quckett Microscopical Club." No. 40. London: D. Bogue.

"Midland Naturalist." August.

"Land and Water."

"Ben Eriery's Journal."

"Journal of Applied Science."

"Feuille des Jeunes Naturalistes."

"Science News." July, August.

"American Quarterly Microscopical Journal." No. iv.

"American Naturalist." August.

"Bulletin of the Essex Institution." Vol. ii. nos. 4, 5.

"Bulletin de la Société Belge de Microscopie." No. ix.

"Annual Report of the Goole Scientific Society, for 1878-9."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—

J. F. R.—J. S.—T. F.—B. H.—G. N.—D. K. B.—C. W.—T. V. D.—F. V. P.—J. W. S.—W. W. I.—S. E. H.—W. F.—W. H. D.—J. B.—J. S.—J. C.—W. H.—R. B. B.—C. F. W. T.—W. J. S. H.—C. V. S.—G. H.—C. B.—J. P.—J. H. W.—A. W.—W. J.—C. H. D.—W. M. P.—E. D. B.—R. H. W.—F. A.—W. W. H.—P. C.—B. M.—T. H. H.—R. A. B.—W. A. K.—M. F.—A. W. S.—E. G. H.—J. F.—A. B.—S. M.—B. H.—J. A.—W. B.—E. S.—D. H.—S. B.—R. T.—W. P.—F. S.—W. S.—F. C. K.—W. E. G.—W. H. T.—J. M. C.—J. S. H.—H. B.—B. S.—G. H.—M. H. R.—C. D. S.—J. T. M.—T. H. A.—A. P.—A. T.—W. H. N.—&c.

LICHENS, AND A POLLUTED ATMOSPHERE.



DURING the spring of the present year, I was very much struck with the disastrous effects of a deleterious atmosphere on the growth of lichens. At the same time, I felt very forcibly the confirmation of the fact that these humble plants, so beautifully covering nature's less graceful parts, as well as pioneering a higher vegetable growth, are themselves acridal plants.

What the water with its solutions is to the Algæ, so the air with its chemical substances is to the lichen.

If the latter fed and nourished its growth through its rhizine or from the matrix, we should be at a loss to understand the utter obliteration of plants in the same circumstances which once flourished in fruited luxuriance. Growing with other plants in the same place, if it nourished itself in the same way, we should naturally expect the lichen to hold its own with its fellows, subject, of course, to those changes which come alike to all vegetable life; but it is not so. The lichen will entirely disappear from a spot without any observable change in the other vegetation around, and that from a pollution of the air which is not sufficient to affect those plants which nourish themselves from the soil or matrix of growth.

In Winch's "Flora of Northumberland," published in the Trans. Nat. Hist. Society of Northumberland and Durham, 1832, mention is made of a number of lichens growing in the woods at Gibside, Durham. Amongst the plants enumerated is *Evernia prunastri* (L.), said to be in fructification in Gibside Woods. As I have never had the pleasure of gathering this species in fruit in any part of North Durham, or the

west and south of Northumberland (which I have more or less searched), I went out to Gibside in the spring to see if I could find the above lichen. Gibside is some seven miles from Newcastle to the south-west. The hall is beautifully placed on the Derwent. The surrounding woods run back on to Whickham Fell. On the latter I found one or two forms of *Callema*, and what seemed to be *Peltigera malacea*, but it was not in fruit, and a few of the commoner forms of *Lecanora* and *Lecidea*. Gibside Woods, barring the atmosphere, are favourable enough for the growth of fruticulose and foliaceous lichens, but for any of these forms I searched them in vain. Not a trace of the series *Ramalodei* could I find. The trees were as barren of *Usnea*, *Ramalina*, and *Evernia* as if they had never known them, and I might say of almost every other form. I found here and there on an old fir a few barren patches of the thallus of some *Calicium*, and I noticed a few forms of *Lecanora* and *Lecidea* by the river side.

The lichens which flourished here in the fine condition spoken of by Winch have perished, and this evidently from the pollution of the atmosphere by the smoke and fumes from the Tyneside, and the collieries of the surrounding district. Though these are a considerable distance from Gibside, yet the deleterious elements travel on the wind, for the trees have that dusky coating on their trunks and branches which is peculiar to trees bordering a town, and which is fatal to lichen-growth.

Gateshead-on-Tyne.

W. JOHNSON.

SKETCH OF THE GEOLOGY OF HAYES COMMON, KENT.

By GEORGE CLINCH.

HAYES COMMON is pleasantly situated in one of the most beautiful parts of West Kent, about two miles from Bromley. It is bounded on the south and west by valleys, and forms a gently inclined plane dipping to the north and north-west. The subsoil mostly consists of pebble beds, which are composed of light brown quartz sand and well-rolled flint pebbles of various shapes and sizes. These beds

form the lower part of what is geologically known as the "Woolwich and Reading beds," and they rest upon the chalk.

Their thickness at Hayes Common is perhaps from thirty to forty feet, but, owing to the absence of any sections in the central parts of the common reaching to the chalk, the exact thickness cannot be definitely ascertained. Most, if not all, of these pebbles are undoubtedly flints derived from the chalk, rolled and ground down into the form of pebbles. But the sand, which occurs with the pebbles, could not have been derived from the same source. Neither could it have resulted from the attrition of the chalk flints. The absence, moreover, of any chalky matter indicates that the sand was obtained from some other rock. My own opinion is this: during the Lower Eocene period the London basin may have received material resulting from the destruction of rocks in the Wealden area. This would easily explain the origin of the sand on Hayes Common; and I am the more inclined to believe in this theory from having frequently observed in the immediate neighbourhood small pieces of worn ferruginous sandstone, such as is very abundant in the upper greensand at Sevenoaks and other places. Sir Charles Lyell, in his "Elements," expresses it as his opinion, that "contiguous parts of the sea were sufficiently deep to receive and retain the matter derived from that waste," (i.e. the denudation of the weald).

The water by which these beds were deposited, appears to have been subject to a variety of currents, giving rise to what is known as irregular bedding; and from the general character of the beds, it seems probable that they were thrown down upon a kind of beach which was continually rising. In one or two instances, however, I have met with *diagonal bedding*, and the dip of the laminae in these cases was toward the east.

I may note here that the "Thanet sand," which is the lowest member of the Lower Eocene rocks, is not present in this part of Kent, although it occurs in considerable thickness in Mid and East Kent.

At the base of the pebble beds a thin stratum of clay occurs, inclosing unworn green-coated chalk flints. Upon the surface a thin band of peat, of from two to eight inches thick, has been formed by the dense vegetation of furze and heath.

No fossil remains of any kind have been found in the pebble-beds proper of Hayes Common; but the writer has frequently found shells characteristic of the "Woolwich and Reading beds," in a bed of clay situated at the south-eastern extremity of Hayes Common, and exposed in section at Coney Hall Hill. Some time since, a skull (in a rather perfect condition) of the *Bos primigenius* was found in the gravel occupying the bottom of a valley in the immediate vicinity.

Perhaps I ought to mention, as an interesting fact in connection with Hayes Common, that recently a

large number of pits have been noticed which are supposed to be the remains of British "pit dwellings." The writer, having found worked flints on the common, was led to open one of these pits (December, 1878), but nothing of importance was found. Before long, it is hoped, other pits will be opened, and thus some knowledge gained of these interesting remains.

Deposits of pebble-beds, similar to that at Hayes, are frequently met with in West Kent and Surrey; and their presence is usually betrayed by the peculiar vegetation which they support. We must not, however, infer that these deposits were once spread over the entire surface of the country. There is good reason to believe that the general features of the country in this neighbourhood remain the same now as when originally deposited and left by the retiring sea.

It will be seen, therefore, that the geological features of Hayes Common, although lacking in anything of an unusual nature, are not, at least, destitute of some interest, and may, after all, teach the young student of nature some facts worth knowing.

ORNITHOLOGICAL ESSAYS.

NO. II.—SPARROWHAWK (*Accipiter nisus*).

By TOM WM. DEALY.

BIRDS of prey form so conspicuous a position in our mountain landscape, that it is no wonder they do not thrive. Shot at, and entrapped by keepers, who have every incentive to wage war *à outrance* against these bold depredators, who wonders at their decreasing numbers? Any winged "vermin" which darkens the zealous keeper's path has but small chance of safety. Rewards are offered him for their heads and limbs; collectors and dealers tempt him to risk his huge form in clambering over precipitous rocks, and gaining dizzy eminences, that he may approach their well-nigh inaccessible cyries. Indeed, when we enumerate the numberless difficulties this tribe of birds has to contend with, our astonishment is that any remain.

Conspicuous among this persecuted family is the subject of this essay. It is one of the short-winged hawks. Most of the members constituting the family Falconidæ may be termed courageous, and are particularly eminent for their bravery and noble carriage; but the sparrowhawk carries with this a degree of impudence and daring which makes it the universal terror of the smaller of the feathered tribe. Many are the stories current of the bold, fearless daring of this hawk—of dashing through glass in impetuous pursuit of its intended victims; of chasing them into rooms, compelling them to take refuge in unlooked-for places, such as flying to man, claiming from him that protection which they cannot find elsewhere. One poor bird, I remember, "took sanctuary"

in the bosom of a lady. When giving chase to its prey, it has been known to dash itself against material objects with such impulsive force as to occasion instant death. I must crave the reader's indulgence in relating the following incident. It shows the remarkable audacity of this bird, and as it is taken from a paper which few of your readers see, I think I am not wrong in introducing it here. "A hawk must live, and many strange tales are told of its powers of flight in chase of its prey. A little incident was witnessed by some gentlemen who were driving through Bickerton lately, which well illustrates its daring when goaded by hunger. The bird was observed for some time. For a period it steadied itself in the air, with imperceptible motion, and then with swift descent darted down upon a rook (*Corvus frugilegus*) which had alighted on a tree. The rook, which was quite as heavy as the hawk, was carried some distance in the talons of the latter, but its weight dragged it to the ground, where the struggle for supremacy was continued; but not for long, as with sharp strokes of the bill the hawk proved itself the victor, and gorged itself with its hardly earned meal."

Yet with all this impudent courage, the sparrow-hawk is sometimes—nay, often—ignominiously put to flight. When it appears in any neighbourhood, the little birds give each other timely warning of the enemy's approach; and, as we think that "unity and combination are strength," so think the little birds, for under this impulse they unite in one body and with loudly iterated twittings of rage and vengeance drive this pert, audacious hawk in graceless retreat from their domains. It is only by calling into full requisition its power of wing that it can make good its escape from its relentless pursuers. Even then the swiftest of them, such as swallows and others, are foremost in the attack, flying round it, uttering shrill cries of vengeance, buffeting it, and tormenting it in various ways, until they are satiated and return to more peaceful duties. Sometimes, however, the hawk will suddenly turn round on its pursuers, scattering them as a whirlwind, and with a loud shriek of blended rage and fury seize one of the bolder of its assailants and carry it off in its sharp talons for its temerity.

Should there be any starling roosts within its radii of exploration, it is sure to pay them frequent periodical visits. Charles Waterton had a starling (*Sturnus vulgaris*) tower, which was occasionally visited by this daring bird. He says:—"His unwelcome visit causes a tremendous uproar. An universal shriek of terror announces his detested presence; and scarcely have I time to fix my eyes upon the tower ere the intruder is off with a starling in his talons."

All the farmyards within a certain distance of its eyrie are well known. It knows to a near guess where a morning's meal is to be procured. It knows which farmyards are well stocked with poultry, and

which are not. If there be any preserves of partridges or pheasants in its vicinage, it will acquaint them with its presence. It levies frequent contributions on all—farmyard and preserve, poultry and game—with a degree of regularity which demonstrates conclusively its effrontery.

This hawk is more abundant than it would appear to be, owing to its shy, wary, restless disposition, which necessitates it to shun man's society, and seek rather the deep solitudes and quiet seclusion of the most tangled retreats of the forest. As the hobby (*Falco subbuteo*) has been called a miniature peregrine (*Falco peregrinus*), so in like manner has the sparrow-hawk been not inaptly termed a diminutive goshawk (*Astur palumbarius*), to which in form it bears some resemblance.

It sometimes perches on the top of a decayed tree or a hedge stake, alighting very suddenly. Its position is very erect, its mien determined and active, and its small head is continually moving about, directing, with searching vigilance, its small keen eyes on all sides in eager search for prey. Its power of sight is very great. It often soars to a great altitude. This cannot be to look for food, the height being such as to preclude the possibility of prey being discerned—keen though its sight—from the elevations often attained. It is doubtless a sense of exuberant happiness and unconcealed joy. Its aerial evolutions, notwithstanding the comparative shortness of its wings, are not altogether devoid of graceful movement as it glides through the higher regions, making circles of more than ordinary diameter with great beauty and effect. It often takes protracted and extended flights, which are apparently executed with every facility. The interior of dark, thick woods of fir or pine appears most suitable to the temperament of this impulsive bird.

A fir forest, on a rugged fell-side, with a stream running through in tortuous passage, is a sure haunt of this bird. It sweeps over the canopy of rustling leaves with quick motion, and, suddenly shutting its wings, drops on some decayed tree; there to rest, or to wait with expectant, vigilant eye and patient perseverance the appearance of some unwary bird, upon which it flies up from its resting-place and gives instant chase. The figure of this hawk is very slim and elegant; its whole contour fitting it for a bold, daring, freebooting existence. In fact, its life is essentially one of continued action and exertion, of marauding expeditions, of ceaseless plunder, and deeds of piracy. Indeed, this bird is a pirate among feathered creatures, the tyrannical despot of the woods, a rover, a pillager, and a plunderer. It shoots through the air like a passing meteor—dark and mysterious—and, as a flash of heavenly light, dashes itself upon its poor, luckless victim, which, by varied intricacies of flight and ever variant manoeuvres, endeavours to evade the sharp talons and mortal clutch of its savage pursuer. One moment, and we behold

it hovering in beautiful flight near the surface of the earth, while in the next we see it, with increasing rapidity of wing, ascending higher and higher, until it arrives at a dizzy height, and there circling with varied and beautiful curves, its piercing eye beholds the illimitable expanse below. But suddenly, with closed wings, as a thunderbolt from the quiver of mighty Jove, as the passage of light through space, it descends with inconceivable velocity, down to the less pure regions below, until it seems that it is about to precipitate itself to certain death on the earth; but no! with expanded wings and broad tail, with a shrill, rapturous cry of exultation, it dashes into the interior depths of the wood. What more fine than the bold flight and wild freedom of this bird!



Fig. 166.—The Sparrowhawk (*Accipiter nisus*).

Let us examine the sternum of this hawk. Look at it, and mark the depth of the keel, and we see clearly indicated great power and extension of flight. Those who have frequented the haunts of this bird must have observed how suddenly it stops in its rapid onward course, and how instantly it alights. Its lofty, protracted evolutions in atmospheric regions and its almost untiring wing evince its buoyancy and lightness, while the impetus with which we have often observed it descend denotes plainly that it likewise possesses an amount of density. However inconsistent and illogical this may sound, it is nevertheless true. It is no illusory theory. It is a well-known established fact, and facts are stubborn obstacles to overcome.

It is pleasant to think of this bird in conjunction with the wild localities it frequents. Our rambles through the dark, gloomy fir forest, or on the rocky slopes of the North, give us abundant opportunities of observing it in all its wild and distinctive characteristics.

Gamekeepers see no beauty in the flight of hawks, or in their wonderful instinctive passages to other climes, or in the rapidity and grace of their heavenward movements. Their sole object, their only desire, is to see their preserves well stocked, and to know that they have rid the neighbouring woods of all "vermin"—for such they designate all birds and

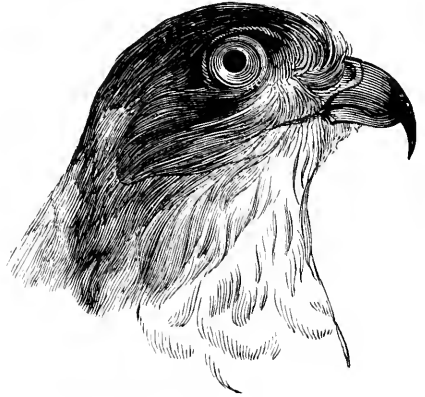


Fig. 167.—Head of Sparrowhawk.



Fig. 168.—Foot of Sparrowhawk.

animals which stand in the way of their darling projects. The sparrowhawk's supply of food involves a question of great import to the keeper, and is worthy of more than passing consideration. All look upon this bird, as well as all other birds bearing the appellation of "hawk," as an enemy, and a hindrance to their object of rearing game, and thus exert every influence to exterminate it. And yet, were it possible to write an exact account of this bird's sustenance, say for a month, and elucidate the results, the rough owner of velveten, little though he may know about the arts of ratiocination, would be surprised. But it is useless arguing with such, it is an unnecessary waste of so much vital force and energy. If, however, they were to study more deeply, and examine more carefully, the habits of this and other birds, they would find all

their reputed arguments fly as chaff before the winds, melt away into nought as the mist before the genial rays of the sun, in the light of the incontrovertible facts they would obtain. They would illumine the prejudices of their darkened illiterate minds. Their "museums" would be empty, and they would become practical ornithologists, then enabled to behold with delight the combined grace and elegance of the movement in mid-air of the birds which before they saw but to shoot. And what is more, their preserves would be stocked with healthier birds.

Were keepers to proceed in a proper manner, they need experience no fear from hawks, and their woods would be filled with finer game. Farmers would not have to employ lads to frighten away sparrows (*Passer domesticus*) and other birds from destroying the ripening grain. The sparrowhawk, nature's own gift, would more effectually do this. Why is it that such birds as sparrows (not, indeed, that I proclaim the ban of extermination against them, because, without doubt, in reasonable numbers they are beneficial in their way) are so superabundant? We need not look far for a reply. The balance of nature is disturbed, nay, her equilibrium is upset, and behold the consequence, witness the result. Granted that the sparrowhawk does occasionally feast on game, that it sometimes makes a meal off a chicken. Frighten it with a blank charge, restrain it in this habit. If you leave your house unguarded, will not the burglars enter? Watch it, and it will soon cease to reiterate its visits. Or, if it does come, it will confine itself to the hosts of noisy sparrows which usually congregate in the stackyard. And what if it does on rare occasions feed on a partridge (*Perdix cinerea*)? What if it flies off with a young pheasant? Who is there who will shoot the wary fox, even though he steals a whole tribe of geese and ducks? All that is required is watchful care and vigilant attention. Keepers of the woods, divest yourselves of selfish prejudice, or the wrong will recoil on your own heads. Learn to study the economy of this bird, and you will find that most of the stolen game you attribute to a winged thief has been taken by a weasel or a fox, or other of the four-legged tribe which inhabit the recesses of your domains.

(To be continued.)

THE HISTORY OF THE APPLE-TREE.

By H. G. GLASSPOOLE.

THE early history of the apple-tree is very ancient, connected as it is with so many legends of remote antiquity. In former days this tree was supposed to have been the tree of knowledge, to whose fruit may be traced all the miseries of mankind, and our first mother, Eve, is generally represented, in the pictures of the temptation, holding an apple in her hand; this is not, however, particularised in the

Bible. The apple is only mentioned five times in the Scriptures, and it is a disputed point if the fruit referred to was the same as the apple of the present day. The climate of Palestine is unfitted for the cultivation of this tree except in the higher regions. In the mythologies of the Greeks, the Scandinavians and Druids, we find the apple-tree mentioned. The golden fruit of the Hesperides, which it was one of the labours of Hercules to procure, in spite of the fierce dragon that guarded them and never slept, were said to be apples, though modern writers suppose them to be oranges.

Thebans used to offer apples on the altars dedicated to Hercules, a custom derived from the following circumstance: on one occasion the river Asopus overflowed its banks to such an extent that it was found impossible to bring a sheep for sacrifice across it, when some youths, recollecting that the Greek word "*melon*" signified both sheep and an apple, stuck four wooden pegs into the fruit to represent legs, and brought this vegetable quadruped as a substitute for the usual offering, after which, the apple was always considered as especially devoted to Hercules. The late Mrs. Bayle Bernard, in her work on our common fruits, gives the following amusing description of the Scandinavian legend of the apple; after having spoken of the Eastern story of the forbidden fruit, she says: "When we come to the cold Norse regions, far from the land where the citron blows, we can have no doubts as to the real pippinism of those apples of immortality kept by the fair Iduna, by regaling on which, the gods of the Edda were wont to renew their youth; the wicked Loke stole and hid away both the maiden and her fruit, leaving the bereaved divinities to pine away, losing their vigour both of body and mind, and neglecting the affairs of heaven and earth until mortals deprived of celestial supervision, fell into all manner of evil; and it almost happened that for the want of an apple the world was lost." Well was it, that at last, summoning all that remained of their expiring energies, they succeeded in forcing the robber to restore those precious pomes on which the welfare of both realms depended.

Leaving the realms of fiction, and the mythological tales of the ancients, let us turn to those accounts which prove that this fruit is one of the most ancient on record. Dr. Heer states that carbonised apples and pears have been found in the Lake dwellings discovered at Concise in Lake Neuchâtel and other similar localities in Switzerland. Apples were more numerous than pears; both are of a small kind, but resemble those which still grow wild in the Swiss forests. However, specimens have occurred which are of a larger size, these were probably cultivated. (Sir John Lubbock, "Prehistoric Times.")

Greece in ancient days, we are told, produced most excellent apples, the island of Eubœa enjoyed an extraordinary reputation for this fruit (see "Athen."

i. 2). Philip of Macedon and his son, Alexander the Great, were so fond of apples that these were placed on their tables at every meal.

Whether the Greeks used to indulge in eating too many apples at their marriage feasts, or that a rare and expensive kind graced the table, cannot now be determined; but it is certain from Strabo that the Athenian lawgiver, Solon, made a decree prohibiting the bridegroom at any rate eating more than one, on such an occasion. Whenever the Romans extended their arms, they availed themselves of the choice fruits of the conquered countries, and the great generals who brought them to Rome, took pride in giving them their own names, as in memory of some great event or service they had done for their country. Thus the apple-tree met with a favourable reception, and was cultivated with great care, for Pliny states that there were many apple orchards near Rome that let for the yearly sum of 2000 sesterces, which is equal to £12 10s. of our money, and some of them, says this author, yielded more profit to the owner than a small farm. The art of grafting, in whatever way it may have originated, was known and practised by gardeners at a very early period. Pliny particularises the quince apple that came from a quince grafted upon an apple stock, which, he says, smells like a quince, and were called *Appian*, after Appius, who was of the house of Claudian, and the first who practised this kind of grafting. "Some apples," says Pliny, "are so red that they resemble blood, which is caused by their being grafted on a mulberry stock." Indeed, he considered that the cultivation and grafting of fruit had reached the highest perfection in his days, for after having mentioned some extraordinary production in the art of grafting, such as the above, and also as having seen grapes, nuts, figs, &c., flourishing all on one stock (which is well known to be a physiological impossibility), he says, "I cannot see how men can devise to proceed further, and for some time no new kind of apple or any other fruit has been heard of."

The Romans possessed in Plinian days about twenty-two varieties of this fruit, known as Manlian, Claudian, Pompeian, Tiberian, and several others by such noble names, who had introduced, or produced, them by grafting. Pliny not only mentions apples of different kinds, but also crabs and wildings, which are small and sour, and for that reason have many a foul word and shrewd curse given them.

The apple appears to have been cultivated in some parts of Britain at a very early period. Whitaker conjectures it to have been introduced by the first colonies of natives, and by the Hædri of Somersetshire in particular, hence Glastonbury was named by the ancient Britons *Ynys Avalla*, which signifies an apple orchard, and from this the Roman name "*Avaloun*" of the place was derived.

The Druids, we are told, paid particular reverence to the apple-tree, because the mistletoe was supposed

to grow only on that and the oak, and also on account of the great usefulness of the fruit. There is no doubt that the Romans introduced new varieties from their own country into Britain, and that they continued to exist during the Saxon period, for William of Malmesbury, an English historian who flourished in the twelfth century, mentions that King Edgar, in 973, lay down to sleep under an *ould* apple-tree, which would seem to imply the existence of cultivated kinds also.

The ancient Welsh bards were rewarded for excelling in song by "the token of the apple spray," and Gwaichmal thus sings:—"The point of the apple-tree, supporting blossoms proud covering of the woods, declares every one's desire tends to the place of his affections." (Daines's "*Welsh Bards*.") After the establishment of Christianity and the Norman Conquest, the monks and heads of religious houses planted orchards, and we find in the reign of Henry II. a bull of Pope Alexander, date 1175, conferring the property of the monastery of Winchcombe in Gloucestershire, and their claim on the town of Twining, with all its orchards, meadows, &c., and in a charter of King John granting property to the priory of Lanthony in the same county, is mentioned the church of Herdesley with twelve acres of land and an orchard. In the beginning of the thirteenth century Worcester had become famous for its fruit trees and the cultivation of the apple had spread over the land. Many varieties were no doubt introduced from Normandy and other parts of the continent. The oldest existing variety on record is the pearmain. In the sixth year of King John, 1205, Robert de Evermere was found to hold his lordship of Runham and Stokesby in Norfolk by petty sergeanty, the paying of 200 pearmain and 4 hogsheds (modios) of wine made of pearmain into the exchequer at the feast of St. Michael yearly.*

Mrs. Barnard tells us that the costard, an apple not often met with now, appears to have been extensively grown in the reign of Edward I., and it is mentioned in the fruiterer's bills of that monarch as *pome costard*. It is supposed that the itinerant venders who hawked this fruit about ancient London were first called *costermongers*, from this circumstance. We do not find any account of the cultivation of apples during the reigns of the monarchs of the houses of York and Lancaster, the country being in an unsettled state and so distracted by civil wars that both agriculture and horticulture were quite neglected until the time of the Tudors, when it is stated that, by the industry of one Harris, a fruiterer to Henry VIII., the fields and environs of about thirty towns of Kent were planted with fruit trees brought from Flanders to the universal and general improvement of the country. Fuller states that one Leonard Maschal, in the sixteenth year of the same monarch, brought pippins from over the sea and planted them at Plumstead in Sussex. Pip-

* See Bloomfield's "*History of Norfolk*," vol. xi.

pins were so called because the trees were raised from pips or seeds, and bore apples which gave them celebrity without grafting.

So important had the cultivation of this fruit become in the reign of Henry VIII., that barking of apple-trees was declared to be felony. The Nonpareil, according to the old herbalists, was brought from France by a Jesuit in the reign of Queen Mary, and first planted in the gardens of Oxfordshire.

Tusser, in his list of fruits published in 1573, states apples of all sorts are grown in this country. The best apples in Gerard's time were the queenings and pearmains, both summer and winter, with some other kinds, amounting in all to seven; but he says there are a great many others, adding that Kent "doth abound with apples of most sorts." He afterwards mentions that he has "seen in the pastures and hedgerows, about the grounds of a worshipful gentleman dwelling two miles from Hereford, called Mr. Roger Bodnome, so many trees of all sorts, that the servants drank for the most part no other drink but that which is made of apples." The quantity is such, that by the report of the gentleman himself, the parson hath for tithe many hogsheds of cider.

Gerard was a warm advocate for the cultivation of this fruit, for in his account of the apple he says, "Gentlemen that have land and living put forward, in the name of God, graffe, set, plant, and nourish up trees in every corner of your grounds; the labour is small, the cost is nothing, the commoditie is great, yourselves shall have plentie, the poor shall have somewhat in time of want to relieve their necessities, and God shall reward your good minds and diligence." The golden pippin, although not mentioned by Gerard, is perhaps one of the oldest of our native apples. It is said to have been first reared at Parham Park, which is situated on the north side of the South Downs, Sussex. The Dutch, in one of their oldest catalogues of fruits, acknowledged it to be an English apple, for they call it the "Engelsche goud pepping." Pippins were, in the time of Shakespeare, delicacies for dessert. Sir Hugh Evans in the "Merry Wives of Windsor" says, "I will make an end of my dinner; there's pippins and cheese to come;" and, again, Justice Shallow, in his invitation to Falstaff, says: "You shall see mine orchard, where in an arboure we will eat last year's pippins of my own grafting." In the valuations of the fruit trees in the gardens at Wimbleton, belonging to the queen of Charles I., there is only one pippin-tree mentioned, so it does not appear to have been very generally cultivated at that period. Phillips states that Catherine, Empress of Russia, was so fond of this apple that she was regularly supplied with it from England; and, in order that she might have it in the greatest perfection, each apple was separately enveloped in silver paper before it was packed. The beginning of the seventeenth century may be looked upon as the golden age of apples, and "orcharding," as it was

then called, became general throughout the country. Lord Scudamore, ambassador to the court of France in the reign of Charles I., collected in Normandy scions of cider apple-trees, and on his return to England encouraged the grafting of them throughout Herefordshire, by which means the county was said to become one entire orchard.

The Scudamore crab, afterwards known as the redstreak, was introduced at this time, and created, we are told, quite a sensation amongst the pomologists of the period. It was a great favourite of Evelyn's, who mentions it in his "Pomona," published in 1664, as an appendix to his "Sylva." Cider was the drink in Normandy at a very early period, from which country it was introduced into England. During the reign of William III. and Anne, when there was a constant succession of wars with France, the use of cider was generally inculcated as tending to the permanent exclusion of the wines of our great rival, so that this drink became one of the chief beverages of the nation. The cider countries principally lie in the form of a horse-shoe around the Bristol Channel.

(To be continued.)

THE BEAR IN SWEDEN AND NORWAY.

By JOHN WAGER.

PART II.

[Continued from p. 131.]

THE surliness of the bear is proverbial; yet gruff as he is accounted, it is also an article of faith in the north that he will never do harm to a child. A remarkable instance of this good-natured forbearance was related to the present writer by a pastor of East Dalecarlia, in which locality it occurred, at a seater to which a she-bear had rambled with her two young cubs, and where the latter were joined in play by two children, to the satisfaction, apparently, of their indulgent dam. Not so, however, to the herd-girl, an older sister of the children, who, on discovering their associates, was seized with alarm, though needlessly; for as soon as she made her appearance, and the youngest child, with an accompanying movement of the hand, bid them "go away now," Mother Bruin and her little ones trotted peaceably and slowly off.

Dr. Berlin, a Swedish author, in his "Läsebok i Naturläran," tells of a bear that intruded amongst some cows that were grazing in a forest of Ångermanland, but was driven away by the little herd-girl; who, mistrusting its intention, and too inexperienced to apprehend the danger incurred, beat it with a stick. Similar cases, it is said, have often occurred in Norway; and the author adds, that such tractable bears have probably never tasted flesh. When at Transtrand, West Dalecarlia, in June 1866, we were informed by the pastor there, that two weeks previously, as a brave little girl was herding goats in the neighbourhood, a bear, despite her vigorous outcry,

seized one of her flock, and had quietly devoured its head and part of the body, when some men arriving drove him off, and shared the remainder of his meal.

The same pastor also related that during the preceding autumn, a bear, on receiving a shot which only slightly wounded him, had rushed furiously at the hunter, and rearing upon his hind legs grasped him in his fore-paws and carried him about two hundred feet, during which transit the man's toes only here and there touched the ground. The bear then laid his burden down, and as the man held his breath and feigned to be dead, his adversary presently left him with an angry growl. The hunter had sustained no injury beyond a superficial bite in the arm, and was soon ready to renew the pursuit. Some years before another Transtrand hunter had a close fight with a bear; the two combatants having for a while hold of

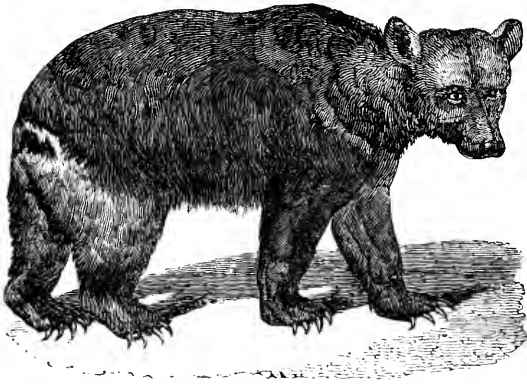


Fig. 169.—The Brown Bear (*Ursus arctos*).

the opposite ends of a gun, but at length the bear was defeated, with the loss of his life. A militiaman, as recorded by Berlin, did not escape so scathless from his contest with a bear. Contrary to orders he had taken his musket with him to a hunt in which several joined; and as it happened the bear rushed towards the spot where he stood, at a distance from the rest of the party. The man attempted to fire, but the priming was wet, and the musket having no bayonet attached proved inadequate to repel the onset of the bear, which struck him to the ground. There he lay, holding his breath, and the bear, after several investigating sniffs, believed him dead, but sought revenge also on the musket. The soldier, thereupon, being anxious to save his weapon from injury, made a movement, but was instantly bit behind the head, so that the scalp was drawn quite over his face. He then again feigned death; whereupon the bear lay down alongside him, but other hunters arriving, the bear was presently despatched. The rescued prisoner eventually recovered from his wounds.

Man is not quite the sole subjugator of the bear; the marauding savage sometimes receives a death-blow where he only expected to dine. A Trondhjem

newspaper records that during the summer of 1872, two bears came upon a herd that was grazing at a seater, in the parish of Flaa; but just at the moment when one of the brutes rose to seize a heifer that stood somewhat apart from the other cattle, a two-years' ox suddenly started from the herd, rushed with an awful bellow at the bear, and with one thrust gored him to death—ripping him open from the stomach to the neck, so that a portion of the intestines hung out. A young herd-boy, who had witnessed the fray, hastily collected the cattle and drove them to the seater-but, where he related the adventure to the dairymaid; adding that though the bear had received a death-wound, its head was still alive. When the woman had counted her cattle and secured them in the shed, she armed herself with an axe and a staff, and bidding the lad follow with a large knife, went in quest of the bears. They found the wounded bear lying dead; but the other had departed, having first, however, almost completely covered his unfortunate companion with moss. The dairymaid, who was sixty years of age, and had spent thirty-five summers at the seaters, then stripped bruin of his shaggy coat. Perhaps it would serve to keep her warm at nights in her old age; or perhaps be presented to the church to comfort the pastor's toes in the pulpit on cold Sunday mornings; a use to which bears' skins are yet applied in Scandinavia, as they were three hundred years ago, when Olaus Magnus, Archbishop of Upsala, wrote his venerable history of the Goths, Vandals, and Swedes.

In exposing the rapacity of bruin we must not forget that he is a king, with certain divine rights within his forest domain, and therefore not without excuse in doing occasionally with tooth and nail what the lords of creation do daily with knife and fork. He has also in common with those lords, besides rapacious tendencies and herbivorous-carnivorous appetite, a trace of good-nature hid beneath his heavy, demure, and solid aspect. We have already given some proof of this assertion, and as it is but fair to look fully on both sides of a character, and to give even the blackest of bears his due, we conclude with an incident that shows bruin to be, sometimes at least, better behaved, and even more humane, than his neighbour, man. The account is derived from the "Falun Tidning" for February 1865.

It is customary for the Laplanders with their reindeer to remove, every autumn, from their summer haunts on the mountains to the lower lands adjacent to the coast; where less snow falls, and better pasturage is found for the herds. Thus, a few years since, several Lapp families had descended with their peculiar breed of long-horns from the Sorsele fjelds, and pitched their tents on the uppermost forest-pastures in the parish of Burträck. Within this tract a bear had fondly hoped to pass his winter days in peace and quietness; and had indeed for awhile enjoyed repose in his lair under a bosky hill. Then

came the Lapps, with their dogs and deer; often pattering over his dormitory, so that he got no sound sleep night or day, and at length roused himself up and ventured out to investigate the cause of such commotion. While quietly making his observations he caught sight in the distance of a Lapp dame, in long snow-shoes, rapidly circling round her herd. She also soon became aware of some unusual object within the dusky skirts of the forest, and at length, after

bear being less alarmed than herself, and quite as inquisitive, came forward and made close inspection of the unconscious housewife; then loosed the snow-shoes from her feet, and grasping her in his supple arms, bore her in the direction of the tent, which stood remotely, out of sight, in a dense grove of trees. He disburdened himself, however, at a considerable distance from it; and as the woman who had regained consciousness in his warm embrace remained perfectly still on the ground, the bear, after regarding her awhile, wended back to his repose. As soon as she supposed he was out of sight the woman rose, returned home, and related her wonderful adventure. Her hearers accredited bruin with great sagacity and forethought in regard to his conduct. He conveyed the woman homewards, they said, because she had approached too near his lair, an intrusion fraught with danger to himself; and he had sagely refrained from bringing her nearer to the tent lest he should be seen or heard by the men, of whose hostilities he was well aware. His wisdom and forbearance, however, availed him nothing; for the ungrateful Lapps, immediately after hearing the story, tracked him to his den, and thrust a spear into his kindly and considerate heart. They sold his hide to the proprietor of neighbouring saw-mills, who preserved it in memory of the singular occurrence.



Fig. 170.—Bear dragging carcass of horse. (See page 130.)

keen scrutiny, discovered that the dark mass really moved, and was no bush, but a bear. It evidently also had an eye upon herself; and being far away from the mountains, the bear's proper resort, this was a very unexpected sight; the woman being moreover in that condition which, according to superstitious belief, renders her sex peculiarly liable to the most furious and voracious attack of the bear, was seized with such sudden terror that she fainted, and fell upon the ground, where she remained insensible long after the reindeer had dispersed on the hills. The

ON PALÆOCORYNE, AND THE DEVELOPMENT OF FENESTELLA.

By GEORGE ROBERT VINE.

THE following paper was written more than twelve months since, but as the points raised in discussing the merits of Dr. Duncan's papers on Palæocoryne were so opposite in character to those already propounded in the "Philosophical Transactions" and in the "Journal" of the Geological Society I thought that it would be wiser on my part to wait further investigations rather than rush headlong into print, thoughtlessly or ambiguously. In the meantime I have submitted the paper to the calm judgment of the Rev. Thomas Huxley, so that I might obtain his opinion on the appendages of recent polyzoa, and also to the experimental scrutiny of Mr. G. W. Shrubsole. Other authorities have been consulted on certain points, and the amended essay on Palæocoryne is my final contribution to this journal on Fenestella. I am glad that these humble contributions have been the means of helping students of the palæozoic fauna to lay before a wider and more scientific range of readers than I could reach, the carefully collated facts, which will be of real service to future palæontologists. It is not only the polyzoa of the palæozoic seas that have been neglected, the other microzoa also deserve the careful consideration of thoughtful students.

Within the last ten years the attention of Palæontologists has been directed to certain fragments of

Fenestella, called by Professor Duncan Palæocoryne. Many of these so-called organisms were common enough, I believe, in the local collections of Scotland, but undescribed. In the year 1869, Mr. James Thomsón, of Glasgow, took a fine series of these fragments to the School of Mines, in Jermyn Street, London. Being unable to obtain any information respecting them there, he took them to the Geological Society. Here they were examined by members, and ultimately they passed into the hands of Professor Duncan, who, with the assistance of Mr. Jenkins, undertook the labour of describing and delineating them. In due time an elaborate paper was read by the chief author before the Royal Society, and afterwards published in the Philosophical Transactions for 1869.

These "organisms" were called by the Professor, Palæocoryne, and an unquestionably unique classification was created for their reception.

Class	Hydrozoa.
Order	Tubulariæ.
Family	Palæocorynidae.
Genus	Palæocoryne.

Their palæontological relationship or affinities were thus established for the time with the Hydrozoa—a class singularly unhappy to place them among. Being satisfied that the fossils should be admitted among the hydrozoa, its anatomical structure must assume the following names :

The dactylose base	= the hydrorhiza.
The stem	= the hydrocaulus.
The tentacular body	= the polypide.
The ornamented hard tissue	= the periderm, or polyzoary.
The faintly-traced genitive structures	= the gonosome.

The rest is embraced under the "trophosome." The term "hydrozome" refers to the whole.*

In his great work on the "Hydrozoa," published by the Ray Society, 1872, Prof. Allman refused to admit Palæocoryne among that class in his monograph. In his criticism on the zoological position assigned to the fossils—and relying upon the accuracy of the figures—he suggested, also most unhappily, foraminiferous relations. Some of his reasons for its rejection were given by Prof. Allman, but these had been, to some extent, anticipated by Dr. Duncan himself, for he says, "Were it not for the calcareous investment, there would be no difficulty in admitting the fossils among the hydrozoa: and had we not been able to avail ourselves of the affinities of the very anomalous genus Bimeria (Wright) the difficulty could hardly have been overcome."†

In May 1873, another paper was read before the Geological Society, and ultimately published in their journal.‡ In this paper Prof. Duncan re-states his former opinions, not more clearly, but still more positively than in the "Phil. Transactions"; and in

a letter to me (Nov. 1877) he stated that he desired to hold his originally-formed opinions respecting the hydroid character of Palæocoryne till other and better evidence were furnished to prove that he was wrong.

In one of the "Memoirs of the Geological Survey of Scotland," Mr. Robert Etheredge, jun., says that the "Survey specimens clearly demonstrate that the base was not cellular, as originally stated by the describers, but that the appearance was caused by the growth of the organism over its object of attachment, a species of Fenestella."* This error of judgment, as well as of observation, on the part of Mr. Etheredge—for Palæocoryne is not a parasite—failed to convince Dr. Duncan of his error.

In December 1874, Prof. J. Young and Mr. John Young, of the Hunterian Museum, Glasgow, furnished jointly two very excellent papers on "New Carboniferous Polyzoa," and on "Palæocoryne and other Polyzoa appendages."† In the last of these papers the Messrs. Young gave fresh and original evidence, showing, by figures drawn with the *camera lucida*, the probable relationship of all the species and varieties of Palæocoryne as appendages of the fenestrate polyzoa. The discussion which followed the reading of this paper was sufficiently characteristic to prove that Prof. Duncan was not convinced, either by the logic or by the figures of the Messrs. Young. Generally speaking I can indorse the whole of the reasoning founded upon the results of the investigations of the professor and Mr. John Young; but there are two remarks—the first and fifteenth—to which I wish particularly to draw the attention of the reader. "The structures named Palæocoryne are organically connected with the polyzoa on which they occur; the tissue of the one is continuous with that of the other, the cells of the base of Palæocoryne being the cells of the polyzoon from which it springs; these so-called organisms are only one type of the processes which are given off by certain Palæozoic polyzoa. The stellate processes called Palæocoryne (*radiata*) are given off chiefly, if not exclusively, from the poriferous—more rarely from the non-poriferous—faces."‡

I am sorry that the opposition of Dr. Duncan so far dwarfed his judgment as to allow him to assert that the Messrs. Young—whose figures proved the contrary—had mistaken pieces of Fenestella for Palæocoryne. This inappreciation of the special evidence furnished in the reading of the paper must have given a comic, rather than a scientific, interest to the discussion; and Mr. Jenkins also failed to comprehend the whole value of the facts, when he asserted that the recent polyzoa *Bicellaria tuba* "possesses an appendage superficially resembling Palæocoryne, but without its definite form and structure. This appendage is very small in comparison

* Dr. Duncan, "Phil. Transactions," 1869.

† Ibid.

‡ "Quart. Journ. of the Geo. Soc." 1873.

* Explanation 23. Scotch Survey.

† "Quart. Journ. of the Geo. Soc." vol. xxx., 1874.

‡ Ibid. vol. xxx.

with the individual polyzoan to which it is attached, whilst the base of Palæocoryne covers a large number of the individual cells of Fenestella."*

With all due respect for the observations of Mr. Jenkins on the appendages of *Bicellaria tuba*, I must differ from him entirely as to the value of his evidence. Through the kindness of Miss Gatty I have carefully examined the polyzoaries of this and other species, and also several of the hydrozoa in her splendid collection, and after the most careful scrutiny—and Mr. Hincks by his silence on this point seems to confirm my view—I cannot find any thing having the least similarity to Palæocoryne. "The fossil appendages in no way resemble those of recent polyzoa or hydrozoa, either in structure, function, or use."†

With regard to Palæocoryne being parasitic on Fenestella, the statement of Mr. Jenkins seems to me to be equally unscientific. I have during the last two years examined hundreds of these so-called organisms, and in no case have I ever witnessed a single specimen, isolated or *in situ*, that would in any way substantiate the morphological view of either Dr. Duncan or Mr. Jenkins as to the parasitic character of Palæocoryne. In some of the best specimens of Mr. Young, in some of my own specimens, in those that I have examined of the late Mr. Harker of Richmond, and in many of the specimens of Mr. Shrubsole, these processes spring at right-angles from the celluliferous face of the polyzoan; they in no way interfere nor interrupt the cell arrangement of the fenestrules in any other sense than that which I shall give farther on. The cells are continued along the base of the process on both sides, as shown in the diagram sketch of Palæocoryne, Fig. 47 (SCIENCE-GOSSIP, March 1879). Sometimes these processes are crushed down upon, and they may by this means conceal, the cells, when apparently the *P. radiata* of Duncan seems to be seated upon the Fenestella; and I do not fear to hazard the statement that in no case is there a separate identity in Palæocoryne, and in no case have I found a specimen that would indicate a parasitic attachment similar to the attachment of *Diastopora megastoma* (M'Coy), one of the commonest of the parasites found upon Fenestella. Furthermore, every correspondent who has sent me specimens of Palæocoryne from his own locality, has prefaced his remarks upon the species with a doubt respecting the hydroid character of the organisms.

Such is the historical sketch of Palæocoryne. All the papers referred to are easily accessible to the student, and are well worth the attention of the general reader, who may be interested in Palæontological questions.

It must be assumed that the whole polyzoary of the Fenestella originated from some fixed spot on which

an embryo had rested. The first process in the development would be a prolongation of the attachment, but what this prolongation was I am unable to say. If I call it a root, any reference to ordinary roots would be fallacious—for of primary roots I know but little. Nearly all that pass by that name are processes developed from the matured, or partially-matured frond. A primary root there must be, but this can only be studied in well-preserved specimens of *F. frutesc.* In a figure of *F. membranacea* before me the "rootlets" are processes springing from the lower and lateral portion of the conical expansion, some of which bifurcate in a most peculiar way, but at the part of the frond where we should naturally look for the primary root it is absent. There is, however, a great difference in the development of Fenestella from the root over that of the processes. Just above the true root, the formation of the fenestrules are very lax, so much so, that Phillips was often deceived by this laxness of fenestrule in his diagnosis of species. In the more general development of the polyzoary of even the same species, there is an almost perfect uniformity of fenestrule. Several of my specimens show this laxness and uniformity of fenestrule in a most beautiful manner, but many of Mr. Shrubsole's specimens that have passed through my hands show it more perfectly than any that I possess, and these remarks are founded upon the study of his rather than my own.

The polyzoary once established, the development of the colony would be carried on by ordinary processes, or by budding.

From a section of a beautiful fragment of *F. plebeia* in my possession I have been able to give an exact outline of several of the cells* and fenestrules of this species. (Fig. 202, SCIENCE-GOSSIP, p. 248, 1878.) On this particular part of the polyzoary a colony of *Diastopora megastoma* had taken up their home, and the cells were well preserved in consequence. In this specimen, the cells (or zoecia) and fenestrules are of a regular and definite shape. On the borders of some of the fenestrules of this specimen, but not in the figured part, there are five pores on one side, and four on the other. The cells are opposite on the borders, and alternate on the whole length of the branch. Here development is by budding, and the dissepiments are originated by the lateral expansion of the zoecium (*a*), Fig. 202. In fact, the dissepiment is nothing more than a portion of the zoecium budding to originate another cell in an opposite direction. I want the reader to note this fact—one that I give the more prominence to now since Professor Allman has stated his views to the Linnean Society, on the perfect zooidal individuality of both the cell and the polypide: "This compound animal is composed of two zooidal individuals:

* Since this was written, I have been able to confirm my originally-formed views by sections of Fenestella, wonderfully preserved in the form of casts in sandstone, from the sandstones of Kirkcaldy, kindly furnished by Mr. Shrubsole.

* Ibid. vol. xxx.

† Rev. Thomas Hincks' corrections of my own reading.

zoecium and polypide: on the zoecium (or cell) devolving the functions of sexual and non-sexual reproduction; and on the polypide that of nutrition."* What are called bifurcations of the branches originate in the same way as ordinary fenestrules, with this difference only: the "budding cell"—if I may be allowed the term—instead of originating a lateral

The formation of some of the forms of *Palæocoryne scotica* (Duncan) is by a lateral expansion of what I will call "infertile" dissepiments. In some cases, as in Figs. 171 to 174, these occur on the outer branches of the Polyzoary without any disarrangement of the cells. The ornamentation of the branch is carried into the prolongation, and in Fig. 174 this seems to be

SPECIMENS OF PALÆOCORYNE IN SITU.

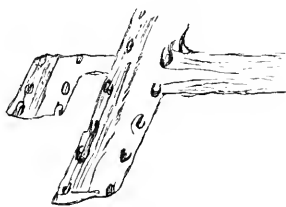


Fig. 171.—From Richmond, in Yorkshire.

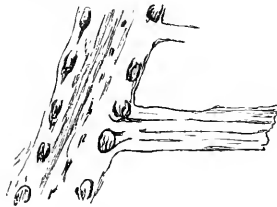


Fig. 172.—From Hairmyres, in Scotland.

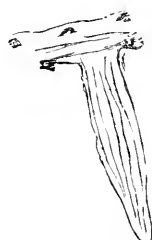


Fig. 173.—Lateral Palæocoryne, from Richmond.

The whole of the figures in this part of my communication are pen-and-ink sketches, but all are highly magnified.

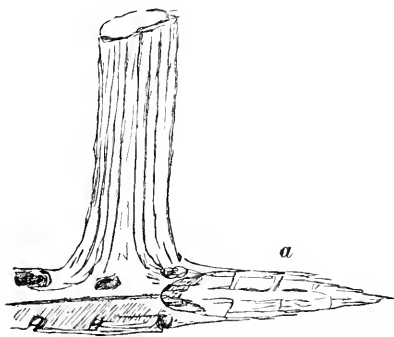


Fig. 174.—Bases of cells exposed through fracture.

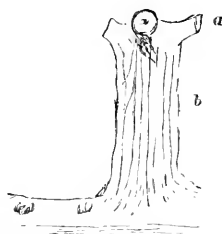


Fig. 175.—*Trophosome radiatum* (Duncan), Richmond. *a*, portion of tentacular capitulum; *b*, trophosome.

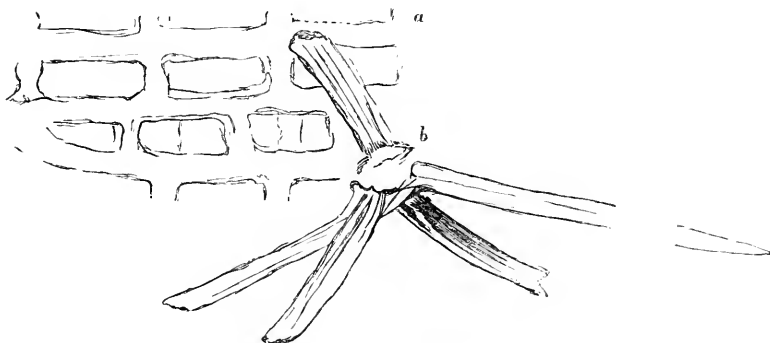


Fig. 176.—*Palæocoryne radiatum* (Duncan), very much crushed and broken; Halkyn, North Wales. (See text for description.)

dissepiment, buds at a slightly different angle, by this means causing a fork-like fenestrule instead of a rectangular one; and it is the bifurcations that help to increase the lateral expansion of the polyzoary.

* In the published address of the Professor in the "Transactions of the Linnean Society," I regret that I do not find the above admission; but I am assured that Dr. Allman gave it as reported in the "Zoologist" for July 1878.

the product of two cells. These "infertile" dissepiments are solid; there is no porosity in any of them to indicate that they were once hollow. Their existence was, from all appearance, for the purpose of reproduction, and so long as they remained unbroken, and attached to the branch, the zoecium had the power of moulding the form of this branch-like projection into

many shapes. There is no difficulty in tracing all the forms of the hydrocaulus of *P. scotica* up to the varied shapes which these branchlets assume. In their natural state—that is, when attached to the side branches—these appear somewhat different to the figures given by Dr. Duncan in the “Philosophical Transactions;” but whenever they are broken away from the branches, a small portion of the poriferous face of the branch is broken off with them, and then, when found unattached in the shale, they present the same characters as the hydrocaulus and trophosome given by Duncan—except the hollow character shown in one of his figures. On looking at the figs. 171 to 174, all the branchlets seem to be thrown off without any expense to the colony. But this is a false idea. In the study of Fig. 205, SCIENCE-GOSSIP, Nov. 1878, it will be seen that there has been general disarrangement in several branches; and the formation of the fenestrules has suffered in consequence of the formation of these branchlets. This specimen has been slightly rubbed down* for the purpose of tracing the connection between the branch and the branchlets. At (a) the bases of the cells are somewhat exposed, and at (b) there is an immature fenestrule, and on the reverse side there are the remains of *P. scotica*, as figured in 205-6. It is not only on the zoecium that the “non-sexual” reproduction devolves, but apparently, from what is shown here, upon the zoarium also. This is no solitary example of the production of Palæocoryne. I have many of a similar character; and I have found, generally, that wherever there is a disarrangement of the ordinary shape of the fenestrule, Palæocoryne in some of its forms is the disturbing agent. On the face there is a contraction, or sometimes a cohesion of branches, while on the reverse there are the bases apparently, but apices in reality, of *P. scotica*. In one of my specimens (Fig. 176) from the Halkyn carboniferous shales, the character of both *P. scotica* and *P. radiata* are preserved. To show this with more truthfulness, I have drawn a portion of the reverse of the Fenestella, and several of the fenestrules. At (a) a portion of the branch is withered, but this part of the trophosome is apparently *in situ*; at (b) also the base of the hydrocaulus is broken away from what Dr. Duncan calls the tentacular surface of *P. radiatum*. In Figure 203, SCIENCE-GOSSIP, 1878, we have an organism altogether different from anything that has been figured or described, and I have striven to give the general as well as the true character of the specimen. The apparent organism is seated astride a fragment of Fenestella. But this hitherto undescribed form is not Palæocoryne.

In Fig. 175, a specimen from Richmond in Yorkshire, I have given the hydrocaulus of *P. scotica*, similar in some respects to the figure of Dr. Duncan in the “Philosophical Transactions.” I give these,

not because they are rare, but as species that are very plentiful. Of these I have several score, and I have studied them in all the gradations from one form up to another, and although my cabinet is enriched by specimens from Yorkshire, Northumberland, Belstonburn, Gare, and Hairmyres, in fact, from nearly everywhere where Fenestella is found, still the whole present the same type—the character of the Belstonburn and Gare series coming nearest to the Yorkshire series, and those from Hairmyres comparing favourably with those from Northumberland.

(To be continued.)

THE ARCHED CROWN; MOTION OF CLOUDS; SPIRAL CURRENTS.

By the Rev. S. BARBER, F.M.S.

THE phenomenon of repulsion between cloud-masses of apparently different composition, to which we drew attention in SCIENCE-GOSSIP for January 1879, as instanced in the case of the “arched crown” over the summit of cumulus, suggests to us this inquiry: how does it happen that in an apparently homogeneous state of the surrounding air, the visible vapour or cloud can assume such varieties of form, and develop new physical properties?

In order to facilitate our conception of cloud phenomena, and to help us to understand the laws which affect them, it is well perhaps to regard the watery atmosphere as distinct from the composition of oxygen and nitrogen by which it is surrounded, and in which it passes through its protean metamorphoses. To consider a cloud as a thing isolated and distinct from the air which encloses and to a great extent permeates it, may not be altogether a philosophical method of regarding the subject; but undoubtedly it has a basis of truth, and is useful in respect to weather study. And inasmuch as various species of cloud possess peculiar thermal and electrical properties, it is not entirely unscientific.

We are therefore justified probably in regarding the principal forms of cloud as *organisms*, actuated by certain laws and exercising *peculiar forces*; playing in fact, an important rôle in the economy of Nature. Thus we may realise the conception of the poet, as embodying not only the ideal beauty, but also something of the physical truth of his subject, when he represents to us the cloud as a beneficent angel:

“I bring fresh showers for the thirsting flowers.”

And again,

“I wield the flail of the lashing hail.”

To give a satisfactory explanation of such electrical phenomena as the “capped cumulus” is, indeed, no easy task; but a better account might perhaps be given of them if aeronauts would provide themselves with instruments of sufficient delicacy: yet the appearance of the sky alters so much with distance that

* “Rubbed down,” not “upside down” as in description.

the results, even then, would be far from satisfactory. The same may be said, with double force, of the extraordinary varieties of form presented by cirrus; lines crossing and curving in almost every conceivable direction. But what we aim at is this—to obtain such general laws as may agree with the analogy of the subject and be of some use, as prognostics, and also to depict and to classify those varieties which are decidedly significant of weather change.

It may be thought, indeed, that classification is very much a matter of *theory*: accurate delineation of separate phenomena has, however, a very *practical* bearing; and the readers of SCIENCE-GOSSIP will, perhaps, endorse the expression recently used by a writer in the "Examiner," who speaks of our present subject as "highly interesting, intimately connected

may be well observed on the coast of East Kent when a north-east wind is setting in. It is curious to notice how these vapour masses advance in regular line to some far distant point with a steady onward march, like vultures scenting their prey afar off.

Some writers seem to regard the clouds themselves as the origin of the aerial currents, and not mere attendants upon them. One fact, however, appears evident, viz., that masses of cumulus moving in this way, are generally accompanied by subordinate and complicated eddies and currents—rotary, spiral, &c., which whirl about them without altering the direct line of advance.

Thus two masses of cloud moving with but a slight interval between them will be attended by their own peculiar, and sometimes *opposite*, currents,

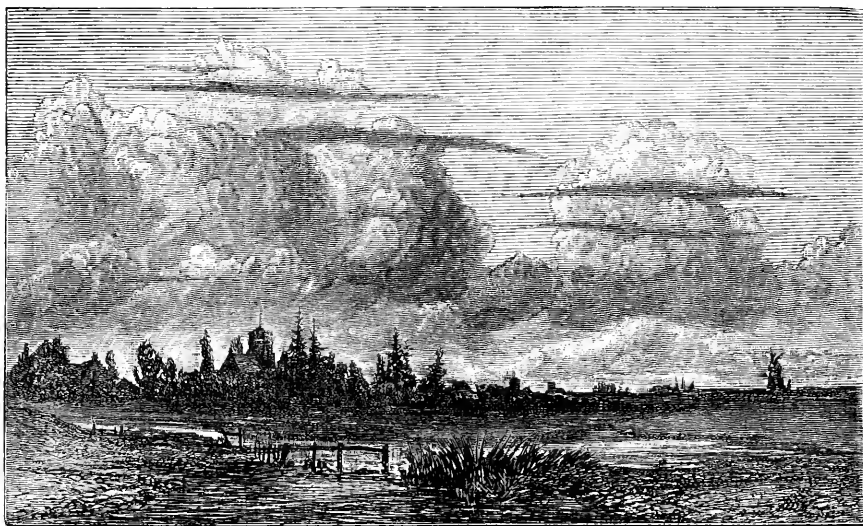


Fig. 177.—Electrical stratus, with capped cumulus in distance.

with, and absolutely necessary to, the science of weather forecasts."

We now draw our readers' attention to the manner in which banks and masses of grey and highly condensed cumulus drift over the sky, chiefly in the spring and winter months, in breezy weather, especially when this is accompanied by heavy rain. This appearance may be contrasted with the phenomenon of the "calling of the sea," the noise caused by the swell of the waves reaching the shore before the wind comes up. In the latter case we have undulations *radiating from* a centre of disturbance; in the former we have vapour masses advancing to a centre of attraction.

Fracto-cumulus,* as Prof. Poëy has termed it, has often a resemblance to an undulating sea of vapour, in the manner in which the masses arrange themselves in banks above each other—an appearance which

while they are both moving on with the general drift, in a steady and regular line.

We will not at present enter upon the inquiry here suggested, as to the extent to which a sudden change in the molecular arrangement may originate movements of the surrounding air; we desire, now, to draw the readers' attention to the manner in which the eddies and spiral currents above mentioned may affect the *form of the mass*. To take one instance, such a spiral current, varying in its radius would be a very probable cause of the lateral compression or characteristic "anvil" form.*

In confirmation of this view, it may be remarked that previous to the gale which these clouds so often portend, we may sometimes observe small cyclones whirlwinds moving upon the surface of the earth, where this spiral motion is more evident from the

* In the case of this cloud, the arrangement in banks and strata is mainly the effect of perspective.

* There are several varieties, however, of this cloud, about which we hope to say more at a future time. See a paper of mine in "Popular Science Review," October 1873.

attendant particles of dust which are absorbed in, and which mark its outline and course. A remarkable instance occurred recently, May, 1879, in which such a whirlwind, formed almost instantaneously, ripped away the entire roof of a house, the surrounding air being quite still at the time.

I have watched from a distance of a few yards a small cyclone of this character, in which the dust, so absorbed, revolved with intense rapidity, while the atmosphere around was perfectly calm. This was on a hot summer day. The presence of such currents of air among the clouds may account for some of the more remarkable forms which these occasionally assume.

MICROSCOPY.

EUGLENA VIRIDIS AND ITS BULBED FLAGELLUM.—In Mr. F. Jas. George's communication of August 1st, number one sketch certainly resembles a *Euglena* of some sort, but does not show flagellum with bulbous termination. The second and third sketches represent a widely different organism. Unless the transitional stages are watched unremittently, the mere fact of one organism succeeding

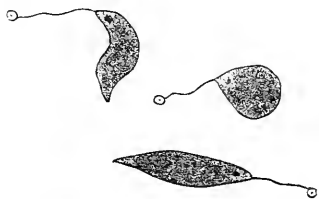


Fig. 178.—*Euglena viridis*, showing the bulbed flagellum.

or taking the place of another cannot be accepted as a veritable metamorphosis, and *Euglena viridis* still remains on the border line between the animal and vegetable kingdom. I enclose sketch by Mr. G. Harkus, showing three of the protean forms commonly assumed by *E. viridis*, and swelling or bulb with which the flagellum ends (Ross $\frac{1}{4}$ -in. B eyepiece+380). These may be of interest, as I at all events have not met an observer who has previously noted this peculiarity.—*M. H. Robson, Newcastle-upon-Tyne.*

MANDIBLES OF ANTS WORN BY USE.—An assertion having been made by the Boston Natural History Society by the Rev. H. C. McCook that the mandibles of ants become blunted, and are even worn off by use, a microscopical examination of about one hundred specimens of *Psammachus* has taken place before the society, when it was seen that all the fresh specimens had perfectly shaped and sharp mandibles, whilst those specimens which were old and worn-looking presented every gradation of bluntness of the mandibles.

THE QUEKETT MICROSCOPICAL CLUB.—No. 40 of the Journal of this well-known Microscopical Society contains the following papers:—"On the Urticating threads of *Actinia parasitica*," by F. A. Bedwell; "On the Rotifers, by dark field illumination," by C. T. Hudson; "On the Micro-Megascop," by Dr. John Matthews; and on "The Dual-Lichen Hypothesis," Dr. M. C. Cooke. The last paper is a thorough and unanswerable demolition of the theory of Schwendener that lichens are only so many algofungi. Nobody was so capable of dealing with this subject as Dr. Cooke, and nobody could have done it so well.

NEW SPECIES OF ENTOMOSTRACA.—At the recent meeting of the British Association, Sir John Lubbock called attention to the occurrence in England of *Leptodora hyalina*, a very interesting crustacean found in the deep Swiss lakes, subsequently in those of Switzerland, Russia, and Italy, and recently found by Messrs. T. Bolton and H. E. Forrest in the Olton reservoir, near Birmingham, though not in any streams or shallow waters. Like many marine organisms it is as transparent as glass—a peculiarity which is of advantage to vegetable feeders, as rendering them less conspicuous to their foes, and to predaceous species by enabling them to steal unsuspected on their victims. The anterior antennæ are peculiarly developed in the males, but quite small in the female. It has been a question whether these organs are for hearing or smelling. The latter seems most probable; where one sex attracts the other by sound, both sexes have the ear well developed. Of course the sex attracted must have a good ear in order to distinguish the sound; but so also must the singing sex, in order to regulate the sound. Hence in such cases we do not find any marked difference between the auditory organ in the male and female. But with smell the case is different. The scent is a specific characteristic, and is not regulated or modified by the will of the individual. Hence, when one sex attracts the other, it is not necessary that the attractive sex should have well-developed organs of smell. Hence Weismann concludes that in *leptodora* the anterior antennæ, being much more highly developed in the male than in the female, are organs of smell. After describing some other curious points in its anatomy, Sir John observed that like other animals of the same group, *leptodora* lay two kinds of eggs—one sort in summer, which hatch rapidly, and a second in autumn which are provided with a thick coat and remain undeveloped through the winter, hatching only when the warm weather returns. It is a most curious and interesting fact that, as Müller observed, these two eggs produce young which are quite unlike one another. In our common *Daphnia* the young at first are quite unlike their parents, having only three pairs of appendages, and being in what is called the "nauplius" stage. Such young

crustacea were at first supposed to be distinct animals and were called nauplius, but subsequent observations have shown that many, he might say most, crustacea, however dissimilar they may be when mature, for instance, the lobster, cyclops, &c., commence life as a small oval being with three pairs of appendages, whence some naturalists following Fritz Müller, are of opinion that all our crustacea are descended from an animal of this form. But lepto-dora during the summer, even in its earliest days, is said to resemble the mature form, differing only in size and some details. It is therefore very interesting that the young when developing from winter eggs should commence life in the nauplius form. Curiously enough, the same reservoir has yielded to Messrs. Bolton and Forrest a new species of Entomostraca which has been provisionally named *Daphnia Bairdii* and which is described by Mr. Forrest in the last number of "The Midland Naturalist." Mr. Bolton has sent out both these interesting animals, in the living state to his subscribers; and he also exhibited them together with many other living microscopical animals with great success at the conversazione in the Cutlers' Hall, Sheffield, during the Association meeting. We are glad to draw fresh attention to Mr. Bolton's scheme, and to express our high satisfaction with the illustrated descriptive portfolio of all the objects he has hitherto sent out, and which can be obtained for one shilling from David Bogue, 3, St. Martin's Place, W.C.

ZOOLOGY.

A TWO-TAILED LIZARD.—A few days since I was shown by Master Attwood of this town, a specimen of viviparous lizard (*Zootoca vivipara*) with a double tail. The duplication commences at about the lower third, the natural tail is about the same size and tapers as usual, and has the proper directions; but the sprout, if one may so term it, stands out at an acute angle, and is about the same size as the normal tail. There is no mark of injury to account for this abnormality, of which I have never seen a similar example.—*Henry Laver, F.L.S., Colchester.*

CORONELLA LÆVIS IN HAMPSHIRE.—I am unable to answer Mr. Tuxford's query (page 164), as to the occurrence of *Coronella lævis* in the New Forest paper; but it may be worth recording that a specimen was killed on the cliffs, west of Bournemouth, in the summer of 1877, by one of my sons. It was supposed at first sight to be an adder, and was hastily struck at and killed.—*W. H. Groser.*

THE BRITISH ASSOCIATION has been invited to visit Leicester in 1882, a town in which it has never yet held its meetings, and there is reason to believe the invitation will be accepted.

URTICATING HAIRS OF CATERPILLARS.—At a recent meeting of the Entomological Society of London, Mr. Swinton maintained that the urticating property of the hairs of the well-known caterpillars of the *Liparis auriflua* was not merely mechanical in its origin, as has hitherto been supposed, but that the hairs were poisoned by a caustic liquid issuing from the scarlet tubercles on the hinder segments.

NEW SPECIES OF BRITISH SPIDERS.—The Rev. O. P. Cambridge in an article on this subject which appeared in the last number of the "Annals and Magazine of Natural History," says, that he has been enabled to add thirty-nine species to the list of spiders known in great Britain and Ireland, since February, 1878. One of the spiders described forms a new genus (*Theridiosoma*), and Mr. Cambridge states that it forms a link between *Theridion* and *Epeira*. The number of known species of British spiders is 519.

WATFORD NATURAL HISTORY SOCIETY.—Part 5 of the Transactions of this vigorous society has just appeared (published by David Bogue, 3 St. Martin's Place), containing the anniversary address of the president (Dr. A. T. Brett), a capital paper on "The Study of Geology," by J. L. Lobley, F.G.S., one on "Bees and Bee-keeping," by the Rev. H. R. Peel, M.A., &c.

PARASITES ON HEDGEHOGS.—In reply to Mr. Singer Barclay's query, p. 205 of present volume, as to hedgehogs having parasites, it may be noted that the common tick, *Ixodes ricinus*, found on dogs, derives its specific name from being found also on hedgehogs.—*X.*

RARE CETACEANS.—I am very pleased to find that by means of my papers on whales, Mr. Anderson was enabled to identify the whale killed off Moville with the giant Sibbald's rorqual. Nobody but a student of this interesting order knows how disappointing it is to see announced in the papers that a whale or whales have been seen or captured on such a part of the coast, not the slightest clue being given as to the species—this has been the case more than once in the past few months—when a very slight acquaintance with the subject would enable the observer in most instances to recognise the species, or at least to note the specific peculiarities which would enable others to do so. My object in writing the papers referred to was to supply in as popular a way as possible such information as would be useful for that purpose. I wish I could reprint it and send a copy to every coastguard station and sailors' home in the kingdom. I have no doubt it would be the means of placing on record the occurrence of many a rare individual which now passes unrecognised. At this season of the year many of the smaller cetaceans, dolphins, &c., follow the shoals of herrings along the coast, and occasionally one gets entangled in the nets of the fishermen, who are too

busy to give it much attention, and pass it by as a porpoise or a "queer fish," good to make into oil, and nothing more is heard of what may in reality be a most interesting occurrence. Such an event occurred the other day at Yarmouth, where I chanced to see in the possession of some long-shore men a very handsome specimen of the white-scaled dolphin (SCIENCE-GOSSIP, xiv. page 87). Nobody had the slightest idea of the species, nor of what variety they were looking at; of course it was a large porpoise. I hope your readers along the coast will keep a good look-out for cetaceans, and satisfy themselves as to the species of every individual which comes under their notice. I shall at all times be most happy to assist them if it be in my power.—*Thomas Southwell, Norwich.*

INSECT SWARMS.—This summer will be entomologically memorable for the vast swarms of the painted lady butterfly (*Vanessa cardui*), which have appeared over so large a part of Europe, including Great Britain. Swarms of the gamma moth (*P. gamma*) have also been seen along various parts of the coast, including Devonshire and Norfolk. They were very abundant at Cromer during the earlier part of September.

BOTANY.

For further particulars on botanical works see "Natural History Book Circular," No. 39, on botany only, 44 pages, post-free on receipt of one stamp, by William Wesley, 28 Essex Street, Strand, London.

An alphabetical list (which I unfortunately do not possess) of 15,000 works on botany, from the earliest to present time, is G. A. Pritzels's "Thesaurus Literaturæ Botanice omnium gentium," &c., new edition, 577 pages 4to., Leipzig, 1877, £2 5s.

Lest any one should be deterred by their costliness from purchasing some of the above works, I may say that some of them, especially the older ones, may be had at very greatly reduced prices.—*B. Hobson, Tipton Elms, Sheffield.*

VEGETABLE "COMMENSALISM."—I have frequently noticed the association of commensalism between butterbur, *Petasites vulgaris*, and one of the most delicious of our edible fungi, I mean *Peziza venosa*, locally known here as the "Jew's ear." It grows at the time when the butterbur is in flower, and as a rule, where you find the peziza, you find the flowers of petasites accompanying it. I have found this so often the case, that now, in examining any fresh locality for "Jew's ears," I generally content myself with looking for butterbur first, one is so much easier seen than the other. The above, like all rules, has its exceptions; still there is no doubt that there is something more than chance in the association of the two

plants. It may be only that the same kind of light sandy soil suits them both, or it may be something more.—*W. D., Carlisle.*

VEGETABLE "COMMENSALISM."—Like Dr. Taylor, I have noticed the *C. perfoliata* and *O. apifera* growing together, in a field at Ewias Harold, Herefordshire, and lately in a field at the foot of the Cotswold Hills, Gloucestershire. On the Cotswolds I found several plants not frequently met with: *Anthyllis Vulneraria*, *Centaurea Scabiosa*, *Orchis pyramidalis*, *Campanula Rapunculus*, *Echium vulgare*, *Scabiosa columbaria*, *Carduus nutans*; also albino specimens of *Campanula rotundifolia*. It may interest you to know that I have found albino specimens of *Pedicularis sylvaticus* and *Geranium Robertianum*.—*T. G. Harris, Cheltenham.*

CATOSCOPIMUM NIGRITUM.—Wilson, in his "Bryologica," gives this moss as fruiting in the month of March, while Mr. Hobkirk mentions specimens collected at Fife, fruiting in August. It may interest your readers to know that I found this plant on August 6 in good fructification, on the sand hills at Formby, thus confirming Mr. Hobkirk's statement. I shall be happy to supply any readers with a specimen.—*Benjamin B. Scott, 24 Seldon Street, Kensington, Liverpool.*

DIPSACUS SYLVESTRIS.—This plant grows plentifully on some parts of the Crumbles, Eastbourne, and during the present season it has illustrated in a striking manner the use of the connate bases of its leaves. The excessive rains of the month of June filled the whole of the connate cups with water, and, notwithstanding the boisterous winds, the stems were sufficiently rigid to resist their action to such an extent as to preserve a good supply of the fluid, especially in the lowest pairs of leaves. On examining them, it appeared that every cup had caused the death of a goodly number of the enemies of the plant, such as ants, caterpillars, earwigs, and such like small deer. There were at least ten or a dozen creatures drowned in the lowest cup of each plant. A few were to be found in some of the higher cups, and in such cases nearly all of the leaves forming the receptacles had contact with adjacent plants. The inference seemed perfectly sound that the leaves were so modified as to collect the rainwater in which small creatures would be drowned, whose visits would be detrimental to the reproductive organs of the plant.—*J. Saunders.*

REGISTER OF FIELD BOTANISTS.—I gladly hail Mr. Melvin's proposition. I have myself, when wandering in a solitary fashion over Westmoreland and North Wales, felt the want sorely. Although it is seldom a month passes away but that I am called away from home, to go with other naturalists over my part of the country; somehow, they find me out.—*R.*

HYPERICUM CALYCINUM (*St. John's wort*).—This plant, though said in Sir James Edward Smith's "English Botany" to be frequently seen ornamenting shady gardens and shrubberies, I do not remember having observed in gardens, since the days of my boyhood, in a damp sunless corner of a rectory in Essex, upwards of sixty years ago, except at Folkestone, where I saw it growing at the edge of a very small clean running streamlet in the garden of the Pavilion Hotel. Being desirous of obtaining the plant for cultivation in a most shady spot, I applied to Mr. Balchin at his nursery, Cliftonville, when I found he had recently introduced it; it was then (September 1) in full flower. It is admirably adapted for damp spots shut out from the sun's rays, where nothing else will grow, and would be a great ornament under the trees in the Pavilion Gardens at Brighton, and especially in a place called the Level, where has lately been planted ivy, as also the *evonymus*, which latter shrub, though it will live, will never thrive under the trees as in the open air; it is a very low evergreen shrub, with very large bright gold coloured flowers. It is noticed in Sir S. E. Smith's "English Botany" as follows: "Few plants flourish so well under drip of trees, but its creeping habit renders it better adapted to the shrubbery than the garden." Flowers from June to October. It needs no other recommendation to those who wish for pretty and cheerful flowers interspersed in shrubberies and among evergreens. The "Treasury of Botany" says this is commonly planted in shrubberies or extensive rookeries, where it is valued not only on account of its handsome flowers, but because it affords excellent shelter for game.—*T. B. W., Brighton.*

SPARTINA STRICTA.—It may interest lovers of the gramineæ to know that this grass, which was thought to have disappeared from this neighbourhood, has been again found; but although now early in September, it has scarcely begun to flower.—*F. H. Arnold, Fishbourne.*

GEOLOGY.

THE METAMORPHIC ROCKS OF SCOTLAND.—Mr. James Thomson, F.G.S., at a recent meeting of the Glasgow Geological Society, exhibited a series of metamorphic rocks from Harris and Loch Maddy, North Uist, and read notes on their stratigraphical aspect, and briefly referred to the opinions of Dr. McCulloch, Sir Roderick Murchison and others who had described the rocks of these islands as belonging to the "Fundamental Gneiss," the oldest series of rocks in Scotland. By some observers these crystalline metamorphic rocks have been regarded as the oldest in the world. Mr. Thomson then described the series in the neighbourhood of Harris in their geological sequence, and referred to some varieties of "granite,"

"granitoid" "gneiss," and to an extensive body of conglomerate he had discovered interstratified with the granite and granitoid gneiss, which consists of fragments and boulders of gneiss, hornblendic gneiss, and granitoid rocks, varying in size from small particles not larger than a small pea, to boulders eight feet in diameter, all more or less different from the rocks that immediately surround the section, and which are embedded in a more or less felspathic matrix, in some places of a dull bluish-gray colour in others of a creamy colour. He then described the rocks in the neighbourhood of Loch Maddy, North Uist, beginning with those exposed on the shore line near the pier, all of which dip to the north-west. About two hundred yards from the pier he found interstratified with the gneissic rocks of the district a bed of conglomerate two hundred and forty feet thick, extending from the shore inland for fully one mile, it may extend further inland, but the section was lost in the banks of one of the fresh-water lochs which occur so frequently in the North Uist, but his time would not permit him to trace further the conglomerate mass. There is an excellent section exposed opposite the inn door. The matrix is felspathic, and is of a dull bluish-gray colour, but in some parts it passes into a somewhat greenish colour. The embedded erratics consist of gneiss, hornblendic gneiss, granitoid gneiss, with some numerous particles of vitreous quartz, varying in size from minute fragments to boulders of considerable dimensions. They did not resemble pebbles and boulders which had been exposed to the action of water upon a coast-line; some were angular, subangular, or rounded, and had all the appearance of having been transported and dropped into a soft plastic matter. Indeed the section is more like some of the sections of boulder drift of more recent times. It had been suggested that the conglomerate might belong to that series described by Dr. Hicks as Pebidian and Dimetian, but a careful examination of the rocks these erratics are interstratified with, led the author to believe that neither the Pebidian nor Dimetian beds are found in the locality. He had seen what he believed to be the Pebidian beds in Loch Carron, and also in Skye, to the south of the Bay of Lucey, near Broadford, where the Cambrian conglomerate is seen reposing upon the Pebidian beds, and which in turn repose upon the Dimetian series. The latter extend to, and are well exposed in the Isle of Ornsay, in the Sound of Sleet, but he had failed to discover rocks of either of the latter series in Harris or Loch Maddy, North Uist. Mr. Thomson referred to the able paper of Mr. James Geikie, F.R.S., and was surprised that no mention was made therein of this section of conglomerate, and more especially as there is one of the best exposed sections opposite the hotel door at Loch Maddy. He then stated that he inferred from the presence of these erratics embedded in the felspathic matrix and interstratified with a series of metamorphic rocks,

which have been regarded as the fundamental gneisses, that we have yet much to learn before any satisfactory solution can be given regarding the true position of the rocks of that district. The presence of these conglomerates interstratified with the so-called fundamental gneisses, is a clear proof that there must have been a pre-existing land from which these erratics have been derived, and another proof that we are not yet in a position to draw the hard-and-fast line between one period and another, nor can we dogmatise as to which are the oldest rocks, or even say which is the oldest form in the life-history of the globe. Mr. Thomson then referred to the striking similarity which existed between some varieties of the graphic granite that had been discovered in the above locality and some varieties considered to be of organic origin. It seems highly improbable that such an extensive series of metamorphic rocks should be destitute of the remains of organic life. There is abundant evidence that during the period they were being desposited there were great sheets of both marine and fresh water. Mr. Thomson said that he merely meant to record the discovery of conglomerate, and reserved the describing of it in a more detailed manner till some future occasion.

COLLECTORS of prehistoric antiquities are warned against fabricated specimens of articles purporting to belong to the age of bronze, and to have been among the remains of lake-dwellings, and in the beds of rivers. There is a regular manufactory of these things near the lake of Bienne, and bronze swords are being offered at a hundred francs each which are not worth as many centimes.

THE MUSK-OX IN ENGLAND.—In a recent number of the "Geological Magazine," Mr. W. Davies, F.G.S., announces the discovery of the teeth of the musk-ox (*Ovibos moschatus*) in the brick-earth, at Crayford in Kent. The specimens belonged to an individual of large size. The distribution of the existing musk-ox is now limited to the barren land of Polar America, between the 60th and 83rd parallels of latitude.

MICRO-PALÆONTOLOGY.—We have received the catalogue of species, sections, and material, supplied by Messrs. G. R. Vine & Son, of Attercliffe, Sheffield. The gradually increasing desire on the part of students to know more of the micro-palæontology of our rocks has induced these gentlemen to master all the details of this intricate study. Mr. Vine, jun., has devoted his attention to the foraminifera and entomostraca, and Mr. Vine, sen., has devoted much time and labour to the polyzoa and other organisms. We were much pleased to notice the importance attached by the general committee of the British Association to Mr. G. R. Vine's labours, by their making him a grant of £10 to enable him to continue them.

GLACIERS IN SAXONY.—Prof. Credner has just discovered polishings and groovings on the surface of porphyritic rocks in Western Saxony, and concludes from these and other facts that the Scandinavian ice reached as far as the neighbourhood of Leipzig, and to the southern border of the North German plain.

"CHEMICAL DENUDATION IN RELATION TO GEOLOGICAL TIME."—Under this heading Mr. T. M. Reade, F.G.S., has published three thoughtful and suggestive papers. One of them, "Geological Time," was his presidential address to the Geological Society of Liverpool; another a paper read before the Royal Society, on "Limestone, as an Index of Geological Time" (which we thought so highly of as to reprint a lengthy abstract thereof in our columns); and a third on "The Geological significance of the *Challenger* discoveries." We are glad that Mr. Reade has been prevailed upon to issue these most interesting essays in their present attractive shape. They are published by David Bogue, 3 St. Martin's Place, London.

THE UNITED STATES GEOLOGICAL SURVEY.—We have received from Dr. Hayden all the publications of this survey from its commencement. What a vast mass of labour and research is here represented! In one of the "Bulletins," Mr. W. H. Holmes describes a remarkable geological phenomenon which occurs on the slopes of Amethyst Mountain, in the now well-known "Yellowstone Park." On the mountainside, which rises to between 2000 to 3000 feet above the river valley, there are exposed at different levels, a series of silicified trees, many rooted in position as they grew, and from twenty to thirty feet in height, while others, broken and worn, are lying at length. Some of the latter are of great size, the fragments measuring as much as eighty-two feet in diameter. The series of sandstone and conglomerates in which the trees are imbedded is more than 5000 feet thick, forming a vertical mile of fossil forests. The woody structure is for the best part well preserved, but where cavities have been formed in the trunks by the rotting of the wood, they are lined with crystals of amethyst, smoky and other varieties of quartz.

THE MIOCENE FLORA OF THE NORTH OF IRELAND.—At the recent meeting of the British Association, Mr. W. H. Baily, F.G.S., Palæontologist to the Irish Geological Survey, reported on this subject. He stated that the fossil plants occur in a deposit of brown and red matter lying between two sheets of basalt. Twenty-five species of plants have been determined. They are most closely allied to the fossil flora of North Greenland, although some of the species occur in the Bovey Tracey deposit, in Devonshire.

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—Is it memory that causes a newly hatched chick to distinguish between a pebble and a grain of rice, or a full-grown bird to distinguish between a poisonous berry and a non-poisonous one? If in these cases a negative reply can be given, and I think it must, and we are to consider animals as being actuated by the same motive powers as man, this certainly goes to prove that reason does exist without memory, inasmuch as reasonable things are done where memory cannot come into play. I speak here of memory as we ordinarily understand the term. Evolutionists would probably say that in the two cases I have mentioned memory, or the effects of memory, are not altogether absent, but by the law of heredity the acts are the results of the memory in ancestors. If we grant this, we have to admit a kind of memory different from that in man. We have, on the one hand, man having the power of acting and thinking freely from his own individual memory, and, on the other, animals impelled by inherited results of memory of their ancestors. Now can it be otherwise, if both animals and man denote intelligence from such different fundamental sources, than that the intelligence of the one must be fundamentally and essentially different from that of the other? It is contended that besides the power of instinct, we are to give animals credit for a degree of reason of the same kind as that displayed by man; but it is difficult to see how it can be possible if a man were born with the instincts of a cat, a dog, or of any other animal, that he could be the same kind of intellectual being he is (or, indeed, an intellectual being at all) that is capable of the same kind of reason. If we can see this would be impossible with man, I think we may fairly conclude that it is not possible with animals. Reason is the result of the exercise of the power of arranging facts, drawing deductions from them, and acting from those deductions uninfluenced by the impelling force of instinct. This kind of reason, I take it, is only possible in man, as he is, so far as we know, the only being who is so uninfluenced. From being so, he is able to act from his own understanding, which, I contend, he would be unable to do were he controlled by any inherent natural motives called instincts, and that instincts, if he had them, would entirely subvert his understanding. From this point of view it would seem that instinct and reason are not only alike, but the one is opposed to and inconsistent with the other, so that where we admit instinct, we preclude reason. It may afford a good illustration of this to consider how man acts when he has acquired strong habits, which become very much like instinct. We see in cases of drunkards, and others addicted to injurious habits, the power to act reasonably with regard to those habits almost, and in some cases entirely, gone. Although it may be known to those addicted that even death may be the early result of persisting in the habits, that knowledge is not sufficient to cause them to exercise reason. We may suppose that instinct being a part of the very nature of animals, and not being subject to the checking influence of the understanding, has a very much stronger force than habit, and therefore, if the above instance is true as to the force of habit acquired by man, and in opposition to his knowledge (and the case is stronger if we bear in mind that sometimes very intellectual persons become hopelessly addicted to injurious habits, after living, it may be, twenty or thirty years an intelligent life), we may easily imagine how instincts of greater force inherent

in the constitution, and capable of being exercised from birth, would preclude the possibility of man acquiring reason, as we understand the term.—*Robert S. Gilliard.*

INTELLIGENCE IN MAN AND ANIMALS.—In my letter of June I showed that Mr. Darwin's arguments respecting the origin of man are based on reasoning by analogy. Now, if the intelligence of animals differs from that of man only in degree, I am at a loss to see why this method of reasoning is necessary, because in that case, whatever is true of man must be true, in a minor degree, of animals; but many passages in Mr. Darwin's works prove that he feels he would not be justified in thus reasoning. That reasoning by analogy is not a safe method, I can illustrate by the mode in which it has misled me. Some time ago I lost a diamond from a ring, and, after some search, found it, and strange to say, close to it an object which I supposed was another diamond, as it closely resembled it in appearance. Reasoning by analogy, I exclaimed, "Since these objects closely resemble each other, they must have had a common origin." Picture my chagrin when a goldsmith informed me that the one I had lost was a diamond of the purest water from the mines of Golconda, and my newly found treasure a piece of glass from Birmingham. The Darwinian hypothesis is not only unsupported by facts, but it is in flagrant contradiction to them. There are some 20,000 species of animals, and not one instance is known of different species being crossed without sterility ensuing in the animal thus begot. It seems a law of nature to keep species apart. Darwin, to support his hypothesis has to assume that there may have been a time when this law was reversed. What would be thought of an astronomer, if he were to argue that though the attraction of gravitation is true now, there may have been a time when an apple thrown into the air would travel for ever in space? Darwin's argument is precisely similar, though its fallacy is not so obvious at first sight. If the theory of evolution be true, a multitude of animals should be discovered in various stages of physical change, which would defy the efforts of naturalists to classify. As is well known, the reverse of this is true. A skilled naturalist finds no difficulty in placing each newly discovered animal in its proper order. Mr. James George asks in the August number, How far is an instinctive act automatic, and how far is it the outcome of volition? The question, if it could be answered, would close this discussion, but I am convinced that it cannot be answered for the following reasons. We perceive that animals have some faculties in common with man, we see too that they have some primal impulses that man does not possess. On the other hand, we see that man has certain faculties, powers of abstract thought, imagination, introspection, and a moral sense unpossessed as far as can be judged by brutes. Some writers consider the moral sense an independent principle, but I am inclined to believe that, if not the result of the above named faculties, it cannot possibly exist without them. The consequence of these differences of nature is this, that in attempting to make a perfect analysis of the brute mind we are confronted with an insoluble metaphysical problem. Let the reader compare what is said on the subject by Darwin, Haeckel, Dr. Carpenter, Henslow, Mr. S. Butler, the letters in "Nature" and in this journal, and I think he will conclude with me that the diversities of opinion expressed are the consequence of the writers overlooking the enforced limitation of thought involved in the subject. For example, in the July number, Mr. James Hooper says: "The

spider weaves its net by instinct. But what if we tear a spider's web, and see the spider examining the mischief that is done, and either giving up its work in despair, or endeavouring to mend it as well as may be? Surely, here we have the instinct of weaving controlled by observation, by comparison, by reflection, judgment." In short, by reason. Now Mr. Hooper here supposes that the web is spun by instinct, but that, when broken, a different set of faculties comes into play. Surely, the primal impulse that causes the spider to spin its web can also repair it. Or, if reason is called into play for the repair of the web, why not for spinning it in the first instance? If so, why talk of instinct? Thus there is always a danger, as I pointed out in my letter of January, of man attributing to animals his own modes and laws of thought. Mr. Samuel Butler, whose works Mr. Hooper quotes, has been recently giving the world a new revelation in the "Examiner," which proves to be a species of polytheism. He thinks that all living beings form part of one great animal, which he calls God, and that the inorganic world was created by another God, and reasoning, by analogy, he thinks that the planets are, to use his own expression, similarly begodded. His argument, he adds, is a corollary of his previous writings. It should be remarked that the truth of his revelation (other considerations apart), depends entirely on the acceptance of the theory of evolution. Such is the result of the wild speculations of this very able writer. I quite agree with "Idea" that a reminder of what some intellectual minds (even if not scientific) have thought on the subject is of the greatest interest. No one disputes the facts laboriously collected by our great naturalists, but the inferences they draw from the facts are open to dispute, and can be discussed by those who are obliged for lack of opportunity to obtain their information from books rather than from direct observation.—*H. D. Barclay.*

INTELLIGENCE IN ANIMALS.—It appears to me that, in the interesting discussion which has been going on for several months in SCIENCE-GOSSIP, sufficient prominence has not been given to habit in animals. We all agree in the fact of instinct; but as to the power or faculty which seems to go beyond instinct, and override it—in olden times it was called sagacity, by way of distinction—there is a considerable diversity of opinion. Doubtless there is in animals something akin to reason, using the term in a vague and general sense, something that looks very much like a process of reasoning, in the facts observed and recorded of them; but after all, is there really anything more than can be fairly explained by the principle of association, by observation, and especially by habit? Does not what may be called the routine of habit, sufficiently account for many of these facts? and do not the mistakes of habit continually occurring lead to the suspicion at least, that there is no act of reasoning properly so called? My dog looks for a run about the time I take the letters to our village post office, and waits quietly outside the door of my dressing room, where I generally am before going; but he does this whether I go to the post or not, it is a habit of his; but he often blunders about the time, and the road I take, when it sometimes varies from the usual one. The baker's horse knows from habit at what houses to stop; but he would, if left to himself, stop at the same houses on going the same road on a day when not carrying bread. We know that horses wish to turn at a given road leading to their home, though their driver wishes to go straight on. It seems to me that these and many similar mistakes of habit, go far to disprove careful thought and processes

of strict, intellectual reasoning in the brute creation. Without entering into nice points of intellectuality or metaphysical operation, I am convinced that the apparently-reasoning actions of animals may easily be accounted for as before stated. Association of ideas from association with man; daily habits, and impulse often arising from these, are surely sufficient to account for the remarkable facts of which we read, and which we personally witness in relation to animals, without seeking to ally them with the intellectual and spiritual parts of man's wonderfully composite nature. In reading the remarks on this subject in SCIENCE-GOSSIP, I have been reminded of the words of the wise man (Eccles. iii. 21) "Who knoweth the spirit of man that goeth upward, and the spirit of the beast that goeth downward to the earth?"—*J. S. B., Pentney, Norfolk.*

INTELLIGENCE IN MAN AND ANIMALS.—From the many instances recorded in your journal and elsewhere, and the numerous others which must occur to the mind of every observer of the habits of animals, I cannot imagine how it is possible to deny to other animals than ourselves the power which we call reason. Define the word as we will, let the cloud of words be ever so delightfully obscure, I do not think the impression which presents itself to one's mind when the word reason is used, will be at all the clearer. I will therefore leave the attempt to those who have more leisure than myself. I wish to give you an instance of what I cannot but regard as reason in an animal. Some two or three years ago I had a very powerful tom-cat called "Muff," a great favourite with everybody, which favour he returned with evident signs of affection. But, alas! Muff was a great poacher, and has more than once come home in a sad plight. On one occasion I was called by my little girl to come and look at Muff, who was lying on the hearth-rug in the breakfast-room evidently suffering intensely. On passing my hand over his side, I found a bunch of wire just level with his fur, and of course saw at once that he was snared; he had bitten the twisted strands of copper wire through close to his body, and thus made his escape, but the snare was still round his loins so tightly drawn as to be deeply imbedded in his flesh, and only to be got at where the wire had passed over his backbone. At this point a pair of cutting-pliers soon relieved him from the painful ligature. Now although I touched the cat as tenderly as possible, the examination must have been extremely painful, but in spite of language which was dreadful to hear, not the slightest attempt to retaliate was made by puss, but rather, by the way in which he resigned himself to my hands, and by the disposal of his limbs, he seemed to, and I have no doubt did, render me every assistance in his power. Let the reader call to mind what occurred the last time he had a tooth extracted, how he screwed up his (what he called) moral courage, and went through the operation. Can I doubt that Muff showed moral courage, and that he reasoned thus? "I am in great pain, my master has never showed me anything but kindness, he can relieve me, and I am sure he will do so. I will therefore submit myself to his hands." If ever cat looked grateful, the expression on poor Muff's intelligent features was that of intense gratitude for the reward of his faith.—*T. Southwell, Norwich.*

INTELLIGENCE IN ANIMALS.—In answer to Mr. Barclay, I briefly state my opinion on this point. If we meet a friend, something enables us to recognise him, some power of distinction (i.e. reasoning in some form, though very simple, perhaps) is called into play. It may not take the form of a distinct

proposition, but I think it exists, although perhaps almost unconsciously. Similarly with animals. Again, occasionally we cannot at once call to mind some fact we wish to use; but a related fact may occur to us, and suggest the one we originally wanted. There is, I think, some reasoning in this act of memory. I admit that in all cases memory may not involve reasoning, but in many it does, although sometimes very slightly and all but unconsciously. I do not think memory is instinctive, though it may sometimes become nearly so. The converse proposition, that reasoning cannot take place without memory, is, I think, true. With respect to Mr. Kitton's suggestion, that the pipes were in the way of the rats, it is certainly a simple explanation. It may be so at times, but it does not follow that the rat could not open a pipe with the intention of obtaining water. The water may sometimes be heard trickling, if not in Mr. Kitton's case, and rats might have more than one motive for cutting the pipes. But in the supposition that the pipes were in the way, the animals might reason about cutting them. If anything were in our way, we should think that, to pass on, we must remove it. Might not the animals do the same? I do not think that it is impossible. In a recent number of "Nature," I see that some reasons are given for thinking that in some instances the memory of localities may be hereditary. If so, this does not make the subject of memory easier to explain. Whether this may favour or oppose my line of thought, it ought to be mentioned, as leading, perhaps, one step nearer to what we are in search of, that is, light and truth.—*A. Wheatley.*

HARVESTING ANTS.—While residing at Mentone during the spring of 1878, I noticed a most curious fact connected with the harvesting ants. When passing through an avenue of plane-trees, I observed some of their seeds apparently walking along, but on closer examination found them to be borne by ants (*Atta barbara*), which were carrying them to their nests. Everyone who has broken up one of the round balls of the plane-tree knows it to consist of wedge-shaped seeds tapering to a point, from whence springs a parachute of long reflexed hairs. The ants were carrying these seeds along by the broader end, and on arriving at the nest attempted to pull them down. But the hairs naturally stuck in the entrance of the nest and rendered it difficult or nearly impossible to draw in the seeds. Several times I took out the seed and placed it with the narrower end—the end from which the hairs spring—downwards, in which case there would have been little difficulty for the ants to get them in. But they almost invariably took the seeds out and put them in the other way. Thus it took a long time to take down each seed, and before they had dragged in many, a great number were accumulated outside; the ground round some of the nests being thickly strewn with them in all directions, for the distance of three or four inches. After laboriously bringing the seeds into their nests, the ants nip off the hairs and throw them out into a rubbish heap or midden. If they were to nip off the hairs *before* dragging them down, or turn them the reverse way, they would, one would naturally suppose, save much time and trouble. I have enquired of several friends, but none of them seem to have noticed this peculiarity; nor does Moggridge mention it in his work on "Harvesting Ants and Trapdoor Spiders." Can you or any of your readers throw a light on this apparent stupidity in insects usually so sagacious?—*G. H. Bryan.*

THE "GRIDING" OF TREES.—Our Poet-Laureate, in his "In Memoriam," has referred to the aspect

of a wood in winter, saying that it "grides and clangs" its many branches, and the distinction between the words is, I find, missed by some readers of the poem. "Gride" is a word of good antiquity; we have a derivative from it in the familiar word "gridiron." Milton has the word "gride" in the sense of "cut," which does not suit Tennyson's application of it here. Seemingly he means the stridulous or creaking sound that the boughs of some species produce as they sway in the wind, contrasting with the deeper sound that is indicated by the word "clang."—*J. R. S. C.*

SHOWER OF POLLEN.—In reference to the notice of a "shower of pollen" at Windsor in *SCIENCE-GOSSIP*, I would say that a similar phenomenon was noticed by a friend of mine in the same town towards the end of June, especially covering the surface of a fountain and some water butts standing in the garden.—*E. G. H.*

LEAVES OF RHUBARB.—Ever since I tasted in Brussels, seven years ago, the delicious dish which can be made from rhubarb leaves, I have urged upon all my friends to try it, and it has been almost universally appreciated by those who like spinach, as, when properly prepared, rhubarb leaves resemble that delicate vegetable very closely, only possessing a slightly more acid flavour, which, however, is most refreshing. To prepare the leaves for the table, the younger ones only should be used; after taking out the ribs and coarser parts, the leaves should be treated similarly to spinach. After boiling, they must be passed through a fine sieve, and then served up either with a little butter on toast or with rich brown gravy.—*Hastings C. Dent.*

UNDER WHAT CIRCUMSTANCES IS THE YEW FOLIAGE POISONOUS TO CATTLE?—A diversity of opinions has, within the last few months, been offered on this subject, and your correspondent "J. H. G. Kettering," who has asked this question in the July number of *SCIENCE-GOSSIP*, may like to hear some of them. Many persons have affirmed that the yew is only hurtful in a dry or withered state, that the fresh foliage was eaten with impunity by cattle, but that the lopped, dying branches invariably proved injurious. Most poisonous plants lose a portion, if not all, their poisonous properties by dying, but not so the yew, according to old-fashioned notions. The number of deaths that have occurred lately in consequence of cattle having partaken of *fresh* yew leaves led to inquiries which resulted in an opinion to the following effect, namely, that the female yew-tree is poisonous, the male not. But this idea has been set aside by the fact that in several instances horses have eaten yew foliage and escaped injury, when other horses, on another occasion having devoured the same trees, have died. An old gentleman, a friend of mine, assures me that "drinking does the mischief." Cattle may, he says, eat *fresh* yew leaves, and escape if they do not drink water for a few hours after their dangerous meal, and I feel very much inclined to think he is right, for a gentleman farmer, living near Less, lost two valuable cart horses lately from the effect of yew poisoning. The animals had been left standing under the tree while the carters were loading, and had, unfortunately, been allowed to drink very shortly afterwards at a stream on their way home; both horses died in the course of three hours to the great astonishment of their owner, who said that "his cattle had browsed those very trees for the last ten years, and he had never known one of them injured before."—*H. E. Wainey.*

"BLACK CORAL," &c.—Can any reader of the SCIENCE-GOSSIP give me any information concerning the so-called "black coral," sold to visitors at Capri? I have a specimen, but feel great doubts as to its being coral at all. I saw in the August number of SCIENCE-GOSSIP (p. 187) a mention of double *Cardamine pratensis*. A quantity of this plant was growing with double flowers last spring on the south-west side of Shotover hill, near Oxford. Is this a peculiar phenomenon? Can any one tell me if Gilbert White was the author of the twenty-six letters on the "Antiquities of Selborne," published in the edition of White's Selborne, with notes by Frank Buckland (Macmillan and Co., 1875)?—A. M. C. T.

RELAXING LEPIDOPTERA.—I have for some years had in my possession a fine specimen of the death's head moth (*Acheronta Atropos*), which was captured at Northallerton many years ago. It had never been set out, and so its wings were folded over its back, the upper ones alone being visible. I succeeded last week in making a very fine cabinet specimen of it, by floating it on a piece of cork, in a basin of boiling water, covered at the top, for a few hours. I was then able to pin it out almost as easily as a fresh specimen, and it has kept its position ever since.—J. A. Wheldon.

WORKS ON APHIDES.—In reply to Mr. A. C. Smith's inquiry for a work on aphides or plant-lice, let me strongly recommend Buckton's "Monograph of British Aphides," with excellent coloured plates, drawn under the camera lucida. It is published by the Ray Society, and will be completed in three volumes, the two first of which have been published. By applying to Mr. Wm. Wesley, Natural History Bookseller, 28 Essex Street, Strand, London, who purchased the work for me, I have no doubt Mr. Smith will be able to obtain it. The coloured drawings comprise not only several forms of each species, but also many of the insects which relate to the aphids, such as the ants, sylphids, aphidivorous ichneumonidae, &c. It is however a pity that the leaves of this and some other works on Natural History are not even cut before being issued for sale. Much time is thereby lost in turning over one by one the uneven edges to find any particular plate. Surely the expense of cutting them by machine must be very insignificant, and it would be a great boon to readers to purchase them evenly cut.—William C. Tait.

DUTCH CLOVER.—The abnormal state of the flowers of *Trifolium repens*, as described by Mr. W. E. Green, has been a very common phenomenon at Darlington this year. I have also found several plants in a viviparous condition. Professor Henfrey, in his "Elementary Course of Botany," states—"In wet seasons it is not uncommon to find flowers of the white clover, with more or less of the organs modified in this way; the pistils, one or more of the stamens, &c., appearing in the form of green leaves, occasionally compound or ternate, as in the stem below." Although I have examined a large number of specimens in this condition, I have not as yet found one in which all the floral organs were converted into leaves; there invariably being portions of the petals and stamens of the normal shape and colour.—J. A. Wheldon.

OUR SINGING MOUSE.—Some little time since we had a mouse which made its home in a little cupboard adjoining our kitchen firegrate. At first it was remarkably shy, but in a few weeks I tamed it, so that it would come to my hand for its evening supper; then it would sit up on its hind legs on the

hearthrug and sing. The song was very like the low warbling of a thrush. In time I came to look regularly for my visitor, for I often sit up alone for about an hour after all my family have retired to rest. If any of the household stayed with me to see my little singer, it would not make its appearance; the only way to hear it was by keeping out of sight, and being very quiet in the lobby. I am sorry to relate it fell a victim to our Manx cat, who, one evening, unknown to myself, had not been turned out of the house—thus ended the life of our songster.—R.

SHELLS OF BROOD EGGS.—In reply to F. M. W.'s query as to what birds do with the shells of their eggs after the young brood is hatched. Some swallows returned to their nests in the eaves of our cottage at Clevedon, Somerset, this year, and have also added two nests since they came back. Our children take great interest in their movements while hawking flies and returning to the gaping mouths of the little ones. My little girl showed me the shells lying amongst the plants just under the nests; they had evidently been thrown out as soon as hatched. This the birds would have no difficulty about; the little beaks, which make such an excellent trowel, would serve admirably as a forceps.—W. G. G.

SHOWER OF POLLEN.—In reply to H. G. Wheeler, in the August number of SCIENCE-GOSSIP, I beg to say I also noticed the shower of pollen at Windsor, on June 8th.—A. Davis.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 5th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

H.—The notion that hedgehogs sucked cows has long since been exploded. It is utterly impossible, from the structure of their mouth and teeth, for hedgehogs to do anything of the kind.

F. CROSSIN.—Your sketch is evidently a figure of the bee-louse (*Braula caca*), a singularly degraded dipterous insect. The commoner parasite of the honey-bee is a tick, and possesses eight legs.

D. D.—The proceedings of the British Association can be purchased each year for one guinea, from the secretary. But the best lectures, addresses, and papers usually appear in "Nature."

J. W. J.—The tree which produces the well-known Brazil-nut of commerce, is called *Bertholletia excelsa*. The so-called "nuts" are in reality seeds.

J. W. WARD.—The "projections" on the leaf are monothalamous or single-chambered galls, produced by a species of aphid, probably *A. eursaria*. Yes, Jackdaws will eat the eggs of other birds if they have the chance.

T. G. HARRIS.—Get the pamphlet "How to Choose a Microscope," price 1s., published by D. Bogue, 3 St. Martin's Place, Trafalgar Square, London. It will give you full instructions as to terms, &c. Beck's economic microscope is an excellent instrument. Davis's "Preparation and Mounting of Microscopical Objects," price 2s. 6d. (same publisher), will give you full instructions as to that department.

MISS F.—The leaves on which the "singular growth" occur, are those of the ground ivy (*Glechoma hederacea*). The nipple-like "growth" is caused by a species of aphid, puncturing the skin of the leaf, and depositing its eggs therein.

R. RENTON.—Accept our best thanks for specimen of *Potamogeton zizis*.

MEDICUS.—As you will have seen, the "American Quarterly Journal of Microscopy" is unfortunately to be discontinued at the end of the present year. The back numbers might be obtained through Messrs. Trübner, Ludgate Hill.

W. H. LITTLETON.—The labels for geological specimens are usually written out; we are not aware of any printed ones. Lists of British coleoptera for labelling may be had of E. W. Janson, 28 Museum Street, London, W.C.

W. A. K. (Salford).—It is the hemp nettle (*Galeopsis versicolor*), often found in potato fields, abundant about Warrington.

E. D. B. (Sidmouth).—It would be difficult to name the plant with certainty from your short description, but we should imagine it would be the privet (*Ligustrum vulgare*) you saw.

T. L. (Heywood).—The specimen sent is a common British plant, yarrow (*Achillea millefolium*), though the pretty variety you enclose is rare.

J. B. B. (Dudley).—We never met with the symphytum with pink flowers, although the petals, soon after the ovules are fertilised, often assume a pinky tinge; it is probably *S. patens* (Sibth.).

C. H. G. (Clifton).—The flower is the sea lavender (*Statice caspia*, Willd.). The leaves of the tree were too much withered to identify. Could you send a dried specimen?

F. B. (Cambridge).—Your specimen is the *Phytocoma pauciflora*. It is rare; on the higher hills it becomes more frequent. Vide "Holiday Rambles on High Lands."

R. F. Z.—Some of the leaves were attacked by the *Aregma obtusum*, a small microscopic fungus, called a brand.

F. C. K. (Aberdeen).—The species enclosed is the hound's tongue (*Cynoglossum officinale*), not very common.

F. H. A. (Fishbourne).—We are not sufficiently acquainted with *Chenopodium paganicum* to venture an opinion; we should name it *C. viride* (L.).

T. G. H.—We believe it is a very rare species, the spider orchis (*Ophrys fucifera*, Sm.), at all events it is not the frog orchis (*Habenaria*) as you have been led to suppose; it is worth looking for; try to find good specimens next year.

ERYTHRAEA.—A very luxuriant example of *E. pulchella* (Fr.).

EXCHANGES.

A FEW beautiful plant hairs, and other slides. Also Pepper's "Cyclopaedic Science," in exchange for Davies' "On Mounting," Slack's, or other good work on pond life.—Jas. Blackshaw, 57 Cross Street, South Blakenhall, Wolverhampton.

WANTED, mammalian skulls. Offered recent shells, serpents in spirit, fossils, or osteological help.—T. Stock, 16 Colville Place, Edinburgh.

WANTED, a good micrometer, in exchange for pair of nearly new stage forceps, with objects (approval).—E. Clover, Springfield Lodge, Sudbury, Suffolk.

WANTED, Irish and European Potamogetons; and European Orobanchae, for rare British plants.—A. B., 107 High Street, Croydon, Surrey.

EGGS of the lesser black-backed and black-headed gulls for exchange. Unaccepted offers not answered.—E. F. Bell, 11 James Terrace, Tait Street, Carlisle.

CLEAN specimens of soundings, containing "orbulina," &c. (with localities), mounted; also slides of fossils, foraminifera, &c.: to exchange for marine deposits or geological material, not necessarily microscopic.—E. Lovett, Holly Mount, Croydon.

FOR cuticle of *Yucca* send a stamped directed envelope to W. H. Gomm, Waltham Abbey, Essex.

FULL and easy directions to extract jaw and teeth of blowfly in exchange for any well-mounted slide of insect dissections—sections of coal or spines, Foraminifera or Polycistina.—G. H. Wrapson, Albert Road, Southsea.

BRITISH shells, plants, and mosses (correctly named), or living plants of *Trichomanes radicans*, and fine specimen of *Todea superba*, in exchange for foreign shells.—T. Rogers, 27 Oldham Road, Manchester.

WELL-MOUNTED slides of *Arachnoidiscus Ehrenbergii*, "selected," for other well-mounted slides: diatoms, parasites, or geological sections preferred.—H. Morland, Cranford, Middlesex.

WANTED, Bentham's "Illustrated British Flora," in fair condition, in exchange for Cook's "Fungi," 2 vols., uncut.—J. C. White, Montpellier, B. Salterton, Devon.

HAVE SCIENCE-GOSSIP for 1872 and 1878, unbound, to exchange for diatomaceous material or slides.—A. Allcote, 11 Foley Street, Langham Place, W.

"LONDON CATALOGUE" offered. Nos. 12, 33, 49, 79, 93, 96, 111, 113, 265, 266, 277, 316, 591, 714, 727, 809, 1003, 1020, 1036, 1129, 1259, 1310, 1323, 1504, in exchange for any of the following: 120, 197, 204, 374, 411, 421, 518, 598, 529, 538, 864, 907, 913, 982, 929, 1236, 1282, 1292, 1299, 1431, 1522, 1545, 1610, 1611, 1621, 1622, 1631, 1632.—W. Jones, 32 Manchester Street, Oldham.

WANTED, a copy of Stark's "Popular History of British Mosses." Reply, stating price, to S. M. P., 2 Westerhall Villas, Weymouth.

MOSSSES, about 100 Somersetshire species in exchange for others. Lists exchanged.—W. E. Green, 24 Triangle, Bristol.

WANTED, common objects for the microscope, mounted or unmounted, in exchange for mounted objects. Send list to Amateur, care of W. H. Symons, 2 Queen's Terrace, St. John's Wood, N.W.

ONE or two works on entomology, list sent. Desiderata, "Duncan's British Moths," or "Wild Flowers," by Shirley Hibberd, published by Routledge.—W. Thomas, care of—Bayley, Esq., Billing Road, Northampton.

I HAVE a few slides of Japanese bilobular paper, splendid polariscope object, to exchange for other well-mounted microscopic slides.—W. G. Daish, Melville Street, Ryde, I.W.

LYELL'S "Principles of Geology," 9th ed., and Darwin's "Descent of Man," 2nd ed., for standard works on geology, biology, &c.—J. A. Lee, Todmorden, Lanc.

FORAMINIFEROUS deposit from the west coast of Ireland, in exchange for good micro objects (mounted) of any description.—Henry Hyde, 2 Ellesmere Street, Regent Road, Salford.

A GREAT variety of sections of wood, pith, and other vegetable structures, in exchange for mosses, etc. Exchange lists.—H. J. R., 184 High Street, Brentford.

WANTED, 20, 33, 79, 97, 131, 133, 165, 206, 218, 277, 452, 476, 515, 615, 841b, 845, 868, 1057, 1057b, 1058, 1084, 1092, 1160, 1169, 1468, 1537, in "London Catalogue of British Plants," for other plants.—H. Searl, 110 Old Street, Ashton-under-Lyne.

HALDON greensand, and other fossils; also several hundred polished specimens of madrepores; 1000 sections of corals for microscopists, and shell sections. Wanted a variety of good foreign cones, no matter if the lips of cones are a little broken. Shells must not be too small.—A. J. R. Slater, Mineralogist, 4 Bank Street, Teignmouth, Devon.

WANTED, English and foreign coleoptera and lepidoptera, as English pupae of moths and butterflies, in exchange for foreign stamps and named British plants.—F. S. L., 2 Oakland Villas, Redland, Bristol.

WORKS now publishing: 51 parts of Chambers's "Encyclopaedia," 30 of "Familiar Wild Flowers," 22 of "Science for All," 18 of "European Butterflies," for good microscope, or dissolving views lantern, or chemical or electrical apparatus.—J. S. Ilsby, 6 Treveltham Terrace, Falmouth, Cornwall.

CORNISH minerals, and crystals, for magic lantern slides, or chemical or electrical apparatus.—J. S. Ilsby, 6 Treveltham Terrace, Falmouth, Cornwall.

PALATES of shell fish, well-mounted and stained, in exchange for shells, moths, butterflies, birds' eggs, and minerals named and localised.—A. D. Innes, 10 Canon Street, Edinburgh.

"LONDON CATALOGUE," 7th ed., 85, 626. *Potamogeton zizis*, M and K, and others, in exchange for plants or mosses.—R. Renton, Fans, Earlstown, N.B.

Will send a number of caterpillars, *Bombyx rubi*, by sending box and stamps for return.—R. Renton, Fans, Earlstown, N.B.

BEAUTIFUL groups of preserved ferns and flowers, quite art gems, which I wish to exchange for micro slides, lepidoptera, zoophytes, seaweeds, or other natural history objects of interest.—M. Medhurst, 1 Gladstone Road, Liverpool.

FINE series of igneous and metamorphic rocks of Charnwood Forest; also various minerals and fossils, in exchange for similar specimens from other localities.—F. G. S., 3 Melbourne Road, Leicester.

BOOKS, ETC., RECEIVED.

"A Dictionary of Plant Names." By James Britten and Robert Holland. Part I. London: Trübner & Co.

"Lectures on the Geology of Leighton Buzzard." By E. W. Lewis. A. P. Muddiman, Leighton Buzzard.

"Transactions of the Cardiff Naturalists' Society, 1877-78."

"Transactions of the Norwich Naturalists' Society," Vol. iii., part 5.

"Proceedings of the Norwich Geological Society," Vol. part 3.

"Transactions of the Watford Natural History Society Vol. ii., part 5."

"Midland Naturalist." September.

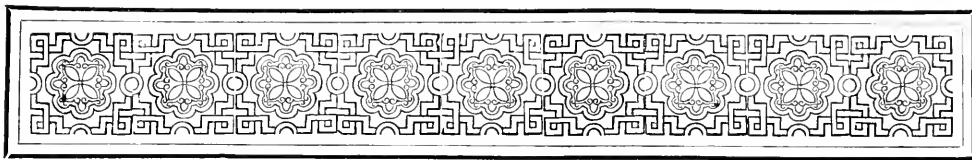
"Land and Water." September.

"Journal of Applied Science." September.

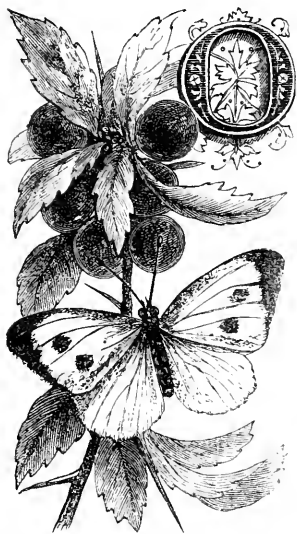
"American Naturalist." September.

"Botanische Zeitung." &c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—H. L.—F. K.—A. A.—W. R.—J. F. R.—E. C. R.—W. E. G.—C. U.—T. B. W.—T. E. J.—C. P.—G. H. W.—T. R.—B. L.—H. M.—A. D.—W. J. H.—J. C. W.—F. C.—D. D.—W. H. G.—G. R. V.—W. D.—F. B.—E. E.—W. D.—W. H. G.—A. B.—E. F. B.—E. C.—G. M. L.—A. M. C. T.—C. McL.—J. A. W.—J. P. E.—L. J. E.—Y. M.—T. S.—W. I.—J. P. T.—J. H. A.—J. W. H. L.—W. H. S.—M. P.—W. G. D.—A. J. R.—J. M. J.—T. G. H.—J. A. L.—H. H.—H. S.—J. S. B.—H. J. R.—W. M.—H. C. D.—J. S.—W. T.—J. S. I.—F. S. L.—R. R.—W. S.—J. W. O.—C. H. D.—A. D. I.—H. P. M.—M. M.—J. W. B.—G. R. V.—H. W. S.—&c.



A GOSSIP ABOUT NEW BOOKS.



WING to the pressure of other articles, we have been unable to give attention to many new books and new editions which have been sent us for notice, until quite a small library has collected on our table. First among them calling for attention is a new edition of that well known and most readable of books, Professor Johnston's "Chemistry of Common Life"

(London : W. Blackwood & Sons). It is edited by a chemist upon whose shoulders in a great measure Professor Johnston's mantle has descended, Professor Church, who has caught up the spirit of the original author in his revisions and eliminations, no less than in the additional new knowledge which has brought the book abreast of modern discoveries. To revise and edit a book like this is no thankful task, and we know of nobody who durst have adventured it with any chance of success, except Professor Church. As now given to the world, "The Chemistry of Common Life" is a most valuable work.

Dr. Noad's "Student's Text-Book of Electricity" (London : Crosby, Lockwood, & Co.) is the other widely known book which now appears in a revised and enlarged form. It is a work which needs no criticism, for its character as a text-book has long been gained. But no modern science has been such an enormous gainer, either in its facts or the philosophical explanation of them, as electricity. To refurbish an excellent but old established manual, with all the new matter and new views, is both a delicate and an important task. But the work has been entrusted to Mr. W. H. Preece, and it is un-

necessary to add that it is admirably done. The student now possesses a compendious and clearly drawn up manual of modern electricity. "The Manual of Bee-keeping," by John Hunter (London : D. Bogue), has gained a third edition, which sufficiently proves that the public have taken it under their protection. This new edition is thoroughly revised and greatly enlarged, and, both as regards type and general appearance, has gained in its attraction. The same may be said of an older and even more general favourite, Mrs. Lankester's "Wild Flowers worth Notice" (London : D. Bogue), which never before appeared in such a glory of coloured plates and gold as it does in this new edition just issued. This book is also revised throughout, and the coloured plates have been greatly improved, both from artistic and botanical points of view.

Two volumes which have caused great discussion among philosophical naturalists during the past twelve months are "Life and Habit" (London : D. Bogue), and "Evolution, Old and New" (London : D. Bogue), both by the same author, Samuel Butler, whose "Erewhon" has its authorship now acknowledged. Those who have read the latter most delightful and cleverly written book, in which picturesque descriptions worthy of Defoe, humour resembling that of Swift, and trenchant satire not excelled by any author in our language, are blended in the most surprising fashion, will naturally turn towards these two volumes from the same author with high expectations. We therefore think it savoured of the greatest temerity for Mr. Butler to enter into a discussion for which he had not been prepared by any scientific training. All that can make a book lively in point of style is present in both the works under notice, and particularly in "Life and Habit," which we like by far the better of the two. It is often pregnant with large and novel suggestions, and will always be a valuable contribution to speculative literature. Mr. Butler's freedom from restraints of any kind gives his books a breeziness which is very enjoyable. In his "Evolution, Old and New," there are many capital "hits" at the weaker places in Darwinism ; but the author seems to us never to have quite risen to the position of thoroughly acquiring

a clear knowledge of the doctrine and bearing of natural selection. This is unfortunate to the Darwinians, for we feel certain that if Mr. Butler had been a convert, he would have been a most valuable one. Again, in his "History of the Doctrine of Evolution," his lack of special knowledge is very manifest, when compared with the article on the same subject in the new edition of the "Encyclopædia Britannica."

Mr. Butler's genius prompts him to adopt an evolutionary philosophy of his own. This is significant, for "Evolutionary" have become rather plentiful of late, and have been evolved by men of such extremely opposite modes of thought as Professor Mivart and Mr. Samuel Butler. But the fact shows that an evolutionary hypothesis of *some kind* is felt to be necessary in both formulating and explaining the material phenomena of the universe. Notwithstanding these remarks, Mr. Butler's "Evolution, Old and New," is a charming book, very thoughtful, wonderfully clever, candid, even to a boldness we have hardly yet learned to recognise as we always ought to recognise the simple telling of what a man firmly believes to be the truth; and the fact that men like Wallace and others have thought fit to earnestly enter the lists with Mr. Butler, in defence of their own theories against his attacks, is one of the best proofs we could adduce of the fertile cleverness of the volume.

"Natural History Rambles Underground," by J. E. Taylor; "Mountain and Moor," by J. E. Taylor; "The Seaside," by Professor Martin Duncan, F.R.S.; "The Woodlands," by Dr. M. C. Cooke; "Lane and Field," by the Rev. J. G. Wood, F.L.S., and "Lakes and Rivers," by C. G. Napier, F.G.S. These six volumes have recently been published by the Society for Promoting Christian Knowledge, and are intended to serve as cheap and popular handbooks to the fauna and flora of the British Islands. Dr. Cooke's book is, as might be expected, most clearly and attractively written; Professor Duncan gives a good deal of new information respecting marine animals, and discourses agreeably also on maritime plants and seaside geography; the Rev. J. G. Wood is a natural history companion who needs no introduction, and his little book is therefore in no need of recommendation. Altogether, we think the Christian Knowledge Society have acted wisely in thus endeavouring to keep pace with the times. It is not long since geology was deemed too dangerous a subject for the Society to take up, but we are glad it is now seen that the Christian faith need stand in no petty or jealous fear of the advancement of true science.

"Organic Chemistry, Practical and Theoretical," by Hugh Clements (London: Blackie & Son), is intended as a handbook for colleges and schools, medical and civil service examinations, and especially for the honours students at the classes of the Science and Art Department, South Kensington. But if the

"honours students" were to repeat in their papers some of the blunders and statements to be found in this little volume, we feel positively certain they would never "pass." "A Treatise in Popular Language on the Solar Illumination of the Solar System, or the Law and Theory of the Inverse Squares; being an analysis of the two received laws relating to the Diminution of Light by Distance, wherein it is shown that, according to undisputed facts of Nature and of Science, the Solar Illumination is equal throughout the whole system, and the Law of the Inverse Squares Physically Impossible," by Collyns Simon, Hon. LL.D. Edin. (London: Williams & Norgate), is a book we do not understand.

The "Outlines of Field Geology," by Archibald Geikie, LL.D.; F.R.S., &c. (London: Macmillan & Co.), is a small—too small—volume, ably and clearly written, and which cannot fail to take its place as one of the best introductions to the study of geology. It is gratifying to find that such distinguished men of science as Professor Geikie do not think it derogatory to their position to write elementary manuals. The "Flowers of the Sky," by Richard A. Proctor (London: Strahan & Co.), is another clever and well written book by this indefatigable author and lecturer; and it puts the general reader pleasantly in possession of the newest and grandest views relating to astronomical science. "Electrical Lighting, and its Practical Applications," by J. M. Shoolbred, B.A., &c. (London: D. Bogue), gives a well written and illustrated account of all that is known concerning electrical lighting, with the results of recent examples. The "Annual Record of Science and Industry, for 1878," is an American work, ably edited by Spencer F. Baird, and published in London by Trübner & Co. The recording of the most important discoveries in the different branches of science has been entrusted to distinguished specialists, so that the results are valuable from their trustworthiness.

THE GEOLOGY OF THE LINCOLNSHIRE MARSHLAND.

By A. J. JUKES-BROWN, B.A., F.G.S., &c.

[Communicated by permission of the Director-General of H.M. Geological Survey.]

MOST people are sufficiently acquainted with the physical geography of Lincolnshire to be aware that the eastern border of the country is formed by a narrow strip of low-lying land known as the *Marshes*, or the *Marshland*. Stretching southwards from the mouth of the Humber, between the sea-margin and the eastern slope of the Wolds, it extends as far as Gibraltar Point and Wainfleet, where it opens upon the broader level of the great Fenland.

The greater part of this district is below the level of the spring tides, and would be constantly under

water, were it not for the long ridge of sand hills which form a wall of defence, and are sufficient to protect the marshes from the influx of ordinary tides or storms; in some places, where the natural earth-work is low and narrow, supplemental banks have been constructed, to provide against the more violent inroads of the sea. Thus protected, the land is now so well drained as no longer to merit its old designation of the marshland, though it is not always secure from inundation by inland floods.

Any one landing on the Lincolnshire coast, opposite Louth or Alford, would find himself on a sandy shore in front of the sand-ridge, which rises in many places to a height of fifty or sixty feet above low-water mark, and is thickly overgrown with the marram grass and sea-buckthorn (*Hippophaë rhamnoides*). Climbing over this he would descend on to a level, cultivated plain, varying in width from three to five miles, and exhibiting some of the best land in Lincolnshire. Crossing this flat country, our explorer would observe its sea-like expanse stretching away to the north and south in unbroken monotony, but passing westward, he would eventually find himself among low mounds resembling islands and promontories, between which the level surface of the plain is prolonged in bay-like inlets; every contour forcibly recalling the time when the marshland was yet in process of formation, and when the tide ebbed and flowed round the muddy shores of these slight elevations.

The older land, of which these mounds and spurs are the outlying portions, extends thence to the foot of the Chalk Wolds, it presents a more diversified surface than that of the outer plain, as indicated in the accompanying sketch-map; and forms a kind of border land between the Wold and the Marsh. Instead of the brown silty clay which constitutes the soil of the marsh, this strip of hummocky and undulating ground includes a variety of soils—boulder-clays, loams, sands, and gravels, with occasional hollows and interspaces, where the black peaty soil attests the former presence of fenny pools and lakelets. It is only, indeed, within the last fifty years that these hollows have been thoroughly drained, and old inhabitants can well remember the time when they rowed their punts and hunted wild fowl over the spots that now present such a different aspect, for the dark waters and the rustling rushes of the olden time have given place to acres of ploughed land and fields of waving corn.

Such a country would not at first sight appear to promise much of geological interest, but the numerous deep wells which have been sunk in this part of Lincolnshire, afford excellent sections of the deposits which underlie its surface, and disclose some facts of interest and importance. Many of these wells are bored completely through all the more recent deposits into the solid chalk which lies below them, and from the data thus obtained it is possible to construct something like a comprehensive outline

of the geological history of the district. I propose, therefore, to take two instances in which the total thickness of material between the chalk and the present surface was thus ascertained; and will endeavour to show by what agencies, and under what conditions the successive members of the series have been accumulated.

Subjoined are the particulars of two borings selected from the many which have been communicated; both places are on the coast, the first about six miles north-east of Alford, and the second about the same distance due east of that town.

I.—BORING AT MABLETHORPE.		Feet.
Post-glacial.	Stiff brown clay	8
	Soft "buttery" clay	11
	Soft brown clay or silt, with black peaty matter in places	27
Glacial.	Stiff clay with a few stones	20
	Sandy clay	4
	Stiff clay with small chalk debris	7
	Chalk rubble	6
	Solid chalk	12
		95
II.—BORING AT ANDERBY.		Feet.
Post-glacial.	Soft brown clay, with marine shells	20
	A bed of turf or peat	1
	Sand and silt	4
Glacial.	Stiff marly clay, with bits of chalk	52
	Sand and chalk rubble	10
	Solid chalk	12
		99

It will be noticed, that though the distance from the surface of the chalk to the surface of the ground is nearly the same in both instances, yet the terms of the intervening series of beds differ considerably. It will also be seen that these deposits are capable of being separated into two groups, and that the chief point of difference consists in the greater thickness of the lower group in the latter boring; the explanation of this fact will be found in the sequel. It will be obvious, even to non-geological readers, that in deciphering the history of these deposits, we must read the record from below upwards, beginning with the period when the oldest were formed, and trace the succession of events from that time to the present.

As we are not now concerned with the formation of the chalk, we need only remark that it is continuous under all the newer deposits, and forms the base or floor upon which they rest. Commencing, therefore, with the newer beds which were laid down on this floor, we find first a rubble of chalk and sand, and then a thick mass of a peculiar kind of clay, which is distinguished from all others by the fact of its containing numerous small pieces of chalk. Near the coast these beds are buried under a newer formation, but westward they come to the surface, and form the undulating ground between the flat marshes and the steep slope of the chalk wolds.

* If we enter any brickyard where the clay is being dug, we shall find it to be stiff brown clay, often mottled

* The greater part of the following description is reprinted from an article published in the *Louth Times* of June 21.

with bluish-grey, not arranged in regular layers, but forming a massive deposit full of chalk débris, together with some larger stones and boulders.

This kind of material is known to geologists by the name of "boulder clay," and this particular deposit is known as the "Hessle boulder clay," from the name of the place where it was first studied and described. Fifty years ago all such deposits exhibiting signs of tumultuous arrangement used to be attributed to the agency of Noah's flood, but subsequent inquiries showed that this was a mistake, and that *moving ice* was the real agent concerned in

along over the rocky bottom with resistless power; they have seen also that the rocks over which the ice passes, are likewise deeply grooved and scratched by the same means. When therefore we find a deposit full of such ice-scratched stones, we know that ice must once have moved over the ground which it occupies, and it is now an ascertained fact in geology that there was a time when the British Isles were surrounded and smothered with ice; this time has received the appropriate name of the Glacial Period, and it is to the later part of this period that the Hessle boulder clay belongs.

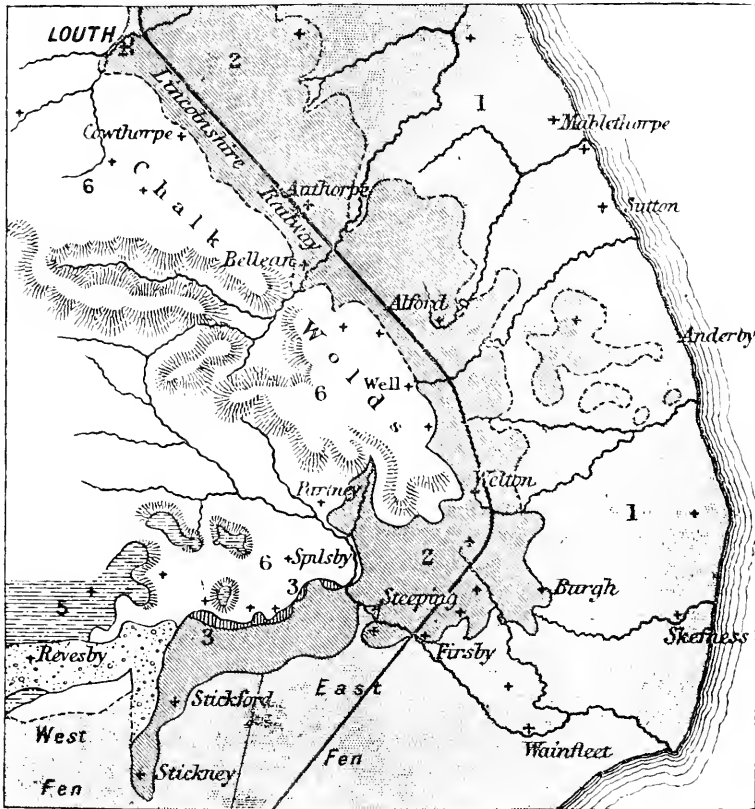


Fig. 179.—Map of the Lincolnshire Marsh Land. Scale about five miles to one inch. 1. Marsh and Fen; 2. Hessle clay; 3. Sandbanks; 4. Gravel and sand; 5. Chalky clay; 6. Cretaceous rocks.

the formation of such clays. But how, it may naturally be asked, can geologists be sure of this? The answer is simple, because the stones and boulders in the clay exhibit marks which can only be made by the action of moving ice. These stones are to the geologist what coins are to the antiquary—they bear inscriptions which are records of the times to which they belong. Men who have seen ice at work on Arctic shores, or who have been into ice-caves under the glaciers in Switzerland, have seen how such marks are made,—how the blocks and stones, frozen into the ice, are scratched and ground as they are forced

A mere inspection of the clay itself, however, will not tell us all that we want to know. There are several different forms of moving ice on the surface of the globe. The glacier which sweeps down a mountain valley; the iceberg, or ice-floe, which grounds in shallow water; the ice-foot, or coast-ice, which surrounds all shores in the northern regions; all these forms of ice are supposed to be capable of producing boulder clay, and further inquiry is necessary before we can discover which has been the agent in the formation of this Hessle clay.

Now there are several remarkable points connected

with its mode of occurrence, which help us in forming an opinion regarding its mode of origin. In the first place, it only occurs on the seaward side of the wolds, entering the Steeping valley and the east fens as if it would if it were a coast deposit, and these were bays in the coast-line of the period. Again, the beds of sand and gravel which occur in and underneath the clay frequently contain sea shells like those now living on the coast. Finally, it would appear that the boulder clay is banked up against the chalk hills to a depth of 40 or 50 feet in some places, and that if we could strip it all away we should find a steep scarp or cliff of solid chalk, like the cliffs of Flamborough Head, only not quite so lofty. These buried cliffs begin at Welton-le-marsh, and pass a little west of the following places—Well, Rigsby, Belleau, Muckton, Cawthorpe, and Louth (see map); and probably northward to the Humber.

For these and other reasons it is believed that the Hesse boulder clay has been produced by the action of coast-ice against the Lincolnshire shore. In order therefore to realise the physical conditions which prevailed at the time when it was being formed, we must read the descriptions given by those who have sailed in Arctic seas, or have visited the northern shores of the American continent. They tell us that the freezing of the sea round the coast produces a shelf of ice, many feet high and sometimes a hundred feet broad, which is called the ice-foot, this clings to the coast all the winter, and from the steeper parts of the shore tons of rock rubbish fall upon its surface, while outside its edge icebergs and loose sheets of ice float in the sea. When spring-time comes great storms arise which loosen the ice-foot and break up the floes outside, driving the latter against and on to the former; in this way great masses of ice are often piled up against the coast, and where the shore is sloping these are often driven far into the land, crashing and grinding over the rocks of which it is composed. After the storms comes a brief but warm summer, the masses of ice begin to melt under the sun's rays and the mud and stones with which they are loaded are left in the shallows along the shore; the upper portion of this material is drifted and sifted by the tidal currents, but the greater part probably remains as an unstratified boulder clay.

(To be continued.)

WHY FLOWERS TURN WHITE.—Could any of your readers explain the reason of some flowers turning white, such as the foxglove, when brought into a garden?—*M. F.*

A PECULIAR AMŒBA.

TWO years ago I obtained some water from a pond, in which, among other things, I found a very beautifully coloured Amœba, a copy of which I enclose. Having never seen any before like it, nor any description of such an one, I drew a sketch of it at the time. The general colour of the creature was of a very light bluish tint, very transparent, and the granules, of which there was a great number, were of a brilliant gold colour, the contrast of colour rendering it a very beautiful object. On reading Professor Allman's address, delivered May 24, 1876, at the anniversary of the Linnean Society, the subject of which was "On recent researches among some of the more simple sarcode organisms," I there find the following description of an Amœba, illustrated by a drawing, which appears to answer to the one

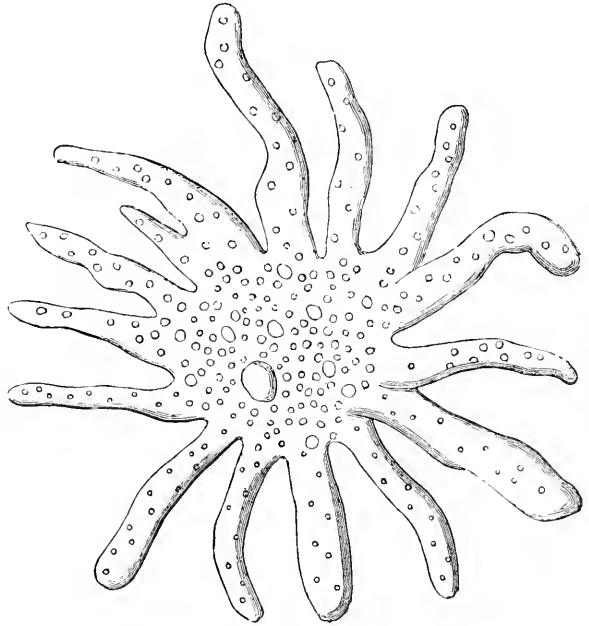


Fig. 180.—Peculiar Amœba (*Dactylospharium vitreum*?).

mentioned:—"Under the name of *Dactylospharium vitreum*, Hertwig and Lesser describe a freshwater rhizopod which but slightly differs from Amœba. It has a roundish body composed of homogeneous hyaline protoplasm with a multitude of yellow or green strongly refrangent granules, which fill the whole of the interior of the body as far as a narrow hyaline margin. The pseudopodia are blunt finger-shaped processes which radiate in all directions from the surface, and consist of a perfectly homogeneous hyaline protoplasm. The mode in which the pseudopodia are withdrawn is peculiar. When one of these is about to disappear, it seems suddenly to change its form; its smooth surface becomes nodular

and irregularly sinuous, it conveys the impression of having suddenly lost its turgescence, and then it rapidly flows back into the body. Numerous non-contractile vacuoles exist; but the multitude of coloured corpuscles so interfered with the transparency of the protoplasm, that it was impossible to decide with certainty as to the presence of a nucleus. In a variety in which the yellow corpuscles are replaced by green, the whole, or part, of the surface is seen to be in most cases covered with fine villi-like processes, a condition very similar to one which has been frequently described as occurring in *Amœba*. Towards the centre of the protoplasm were numerous pellets composed of foreign matter, evidently the remains of nutriment derived from plants and ingested as in other amœboid organisms."

In the specimen I had, the rich yellow granules not only filled the body, but were thinly scattered through all the pseudopodia.

Canterbury.

J. FULLAGAR.

ORNITHOLOGICAL ESSAYS.

NO. II.—THE SPARROWHAWK (*continued*).

By TOM WM. DEALY.

THE sparrowhawk is a great destroyer of bird-life. In fact, birds constitute its exclusive food. Gamekeepers wrongly imagine that every bird which is lost out of their woods has been eaten by this hawk, which on these fallacious grounds is subjected to a rigorous persecution, and, as a consequent result, it becomes rare, and more rare every year. It is a great error that this bird, as well as all others comprised under the head *Raptores*, were not included in the Wild Birds Protection Act, because the birds they kill to support themselves are necessarily the weak and diseased ones in the flock, which cannot fly away quickly enough to elude the deadly grasp of the hawk; and which, if left behind, would in all likelihood sow more widely the germs of disease, and thus lead to a far heavier mortality than the hawks cause. Of course, my allusions now apply to game; for hawks are surely not begrudged any sparrows they may destroy. In mediæval ages both game and hawks were to be found in profusion. Then the sickly birds of a flock fell a prey to some hovering hawk. Why should not the same proportion exist now? In a few years hence the sparrowhawk will become like most of the genus—rare. It cannot but give pain to the feeling of every true ornithologist, to behold the rows of hawks which are nailed on the gable end of the keeper's house.

While spending my Midsummer vacations, I became acquainted with a keeper who inherited with his title all the inveterate hatred of his "caste" to hawks. I talked with him, but he would not be convinced. In the midst of a futile effort to wean him from his perverted opinion, I said, "Then bring me the next pair

you shoot; we will examine them, and you will then see that I am right!" He smiled superciliously as he answered, "Well, I will, and I'll be bound to say, you'll find 'em stuffed with young game." I made no reply, because I saw that he was steeped in ignorance, and that anything I said would be of no avail.

He brought me a pair at noon next day, which he had shot that morning. I opened them in his presence that he might see the result himself. In the stomach of the first—a matured male—were the partly digested remains of a pigeon, species irrecongnisable, but the presence of a foot told it was a pigeon. I made no comment, but proceeded to the stomach of the second. I found the undigested parts of some small bird, probably a robin or a linnet. Here was something for him! He was rather less decided, but with the most perfect nonchalance he extenuated his argument by attributing the absence of game from their stomachs to the constant watch he exercised over his young birds. However, I asked him to bring me the next hawks he killed. I chanced to be with him when he shot a pair—male and female. I again dissected in his presence. He expressed his unbounded confidence that we should find game in these, because he had lost a couple of young pheasants from his covers that very morning. He was mistaken. The male contained the several parts of a sparrow not yet so sufficiently digested as to be past recognition. I extracted both legs and claws quite uninjured from the mass of food. From the female I took the totally unrecognisable body of some large bird; which from fragmentary evidence we concluded must be a thrush. He promised to think about it, and examine for himself, and should he find his doubts still further strengthened, he would refrain from destroying them.

It may probably be of interest to many to read the following curious calculation, relative to the birds destroyed by the sparrowhawk.

Suppose there is one pair of sparrowhawks to every twenty square miles of the British Isles—which is a very moderate calculation far below the number. There would then be no less than 6075 pairs of hawks, in all 12,150 birds. Again, suppose each of these to consume three birds—sparrows we will say—per day. They would destroy 36,450 sparrows per diem, 255,150 per week, and 13,304,250 per year of 365 days! Let us suppose this immense number of birds to be in a flock, flying. We will allow each bird a square foot for freedom of movement. There would then be a compact mass of flying birds nearly a mile long and half a mile wide. What a mass of birds! And yet this is the amount which would be actually destroyed by the sparrowhawks of the United Kingdom in one year if left unmolested. Again, if the victims were placed in a cubical mass, say that each bird is five inches long, two wide, and one in depth, they would form a cubical mass which would completely fill a box a little over sixteen and a half

feet cubed ; that is, a box sixteen and a half feet long, sixteen and a half feet wide, and sixteen and a half feet in depth. What a holocaust offered up at the shrine of agriculture ! and yet it is rejected.

Again, were each bird to average two ounces, there would be a weight of 1,663,031 $\frac{1}{4}$ pounds, or about 742 $\frac{1}{2}$ tons. Endeavour to imagine the number of railway trucks they would fill. Farmers, Agriculturists, cannot you see the benefit which you would gain if the country were rid of all this ? And yet we wantonly destroy the means which Nature has given you to obtain it.

Suppose each victim were to eat—we will not be extravagant—say 100 grains of corn (or its equivalent from the produce of the land) in a season ; we will ignore that which they destroy and do not eat ; they would eat 1,330,425,000 grains. If 8000 grains fill a pint measure, there would be 166,303 $\frac{1}{4}$ pints of grain, or about 65 loads. I leave it to others to estimate what this is worth, as I think I have carried the calculation far enough to show that it is altogether to the detriment of farmers and agriculturists to destroy hawks. In other manners I have demonstrated how they are of value to keepers. Enlist the services of hawks and they will reap benefit everywhere.

One is often surprised when passing through plantations in our country rambles, at seeing a sparrow, or other similar bird fly past us, with great haste and precipitation, the while uttering piteous, plaintive cries. The astonishment, however, diminishes as we see a dark form glide quickly by and turn round the moss-grown rock past which the doomed bird flew. The dark form is the much dreaded sparrowhawk ; and no doubt were we to extend our walk a short distance in the proper direction, we should disturb the sylvan tyrant enjoying its sanguinary meal with evident satisfaction.

The female is a stronger, larger, and more courageous bird than her mate, and such birds as thrushes (Merulidæ) and even larger birds, as lapwings and pigeons—find in her a very powerful foe. She will not hesitate in attacking a plover and will bear it off in her talons. The derivation of its local name of "Pigeonhawk" needs no explanation. She is also a swifter bird than the male, and may be seen at one moment flying along a hedgerow, or by the edge of a grove of trees, while immediately after we see her darting madly through the woods, quickly threading the labyrinth of branches in quick chase after her frightened prey, which, however, seldom escapes, so deftly are the numerous twistings and turnings executed. I have oftentimes wondered how this bird could proceed at such a tremendous speed. In its passage it makes a loud disturbance in the air, as of a loud wind, and is lost to view behind the screen of some outjutting rock, or is hid by a clump of dark green foliage.

The sparrowhawk loves to feed off a fine plump chicken, and will venture much to procure one. If a farmyard be situate in the vicinity of its site of nidifi-

cation, it does not scruple to pay its visits at intervals—particularly in the grey dawn of morn, or in the growing dusk of evening. It dashes over the intervening hedge, sails across the yard on outspread pinions, snatches up one of the heaviest chickens, glides stealthily round the barn, and darts across the adjacent meadows, away to some sequestered nook in the woods, there at leisure to eat its stolen morsel. The goodwife, on coming out to see the cause of all the noisy cackling occasioned by the recent visit, only sees the old white hen, clucking vociferously and collecting all her young fry around her. If not checked in the habit, the sparrowhawk will soon learn to repeat its visits, until at last it has robbed the yard of all its chickens.

An old, grey-headed keeper recounted to me a wonderful instance of this bird's daring. He was feeding some young partridges, and his hat was actually swept off his head by some passing object, at the same time he heard a noise as of a body passing rapidly through the air. The next thing he saw was one of the young birds he was attending, being borne off by an audacious female sparrowhawk. The partridges were at the time not two yards distant from him.

I have known a bird of this species attack a hen sitting on eggs under a hedge, and to pluck a quantity of feathers out of its tail and back.

Like other European birds of prey, this bird has a representative in Australia, the collared sparrowhawk (*Accipiter torquatus*). We read that this bird is similar in most respects to our own. Gould says it "has all the characteristics of its European ally." In North America it is represented by the American sparrowhawk (*Falco sparverius*, Wils.) which, according to Wilson, appears to possess all the inherent wild courage and audacious manner of our own bird.

(To be continued.)

ON PALÆOCORYNE, AND THE DEVELOPMENT OF FENESTELLA.

[Concluded from p. 229.]

By GEORGE ROBERT VINE.

I COME now to what are called the spiniferous processes of Fenestella, the most peculiar of the whole group. Several figures of species of these are given by the Messrs. Young in their paper on Palæocoryne, Vol. 30 of the "Quarterly Journal of the Geological Society ;" some are *in situ*, others are detached. The Messrs. Young give figures of different species of Fenestella, with the spiniferous prolongations attached, and they also give figures of specimens found in the shales of Hairmyres and elsewhere in detached fragments. Dr. Duncan does not take these processes into consideration in his papers on Palæocoryne, and in the discussion which followed the reading of Messrs. Young's paper both Dr. Duncan and Mr. Jenkins failed to comprehend

the value, or even the bearing of the illustrations furnished by the authors. I have said before that the processes—fertile or sterile—*Palaeocorynæ*, are unique in character and type, and it is only folly to seek for similar processes in any of the modern species of *Polyzoa*.

In these papers I have endeavoured to give illustrations only of specimens of polyzonal processes from my own cabinet, or from specimens that have actually passed through my hands; but as I have been supplied with sketches of processes from the cabinets of others, I could not resist the temptation

different from the one here figured. The specimen from which fig. 181 is given, is a perfect study of this particular process. It is from the Halkyn series of *Fenestella*, and the drawing is made from a section of the shale only partially rendered transparent. The figure represents the outer portion of the frond of *F. plebeia*, and the spiniferous processes are unlike any of those given by the Messrs. Young. The branch (*a*) originates in the dissepiment marked *a'* in the fig. 181. It passes on then to a dissepiment higher up, then into another, until it reaches the outer branch, the continuation of which is spiniferous until it reaches the extremity shown in my section. Mark the character of this branch. There are regular dissepiments part of the way up until at last the two branches coalesce, and continue then, apparently, as one solid spine. The two lower spiniferous branches

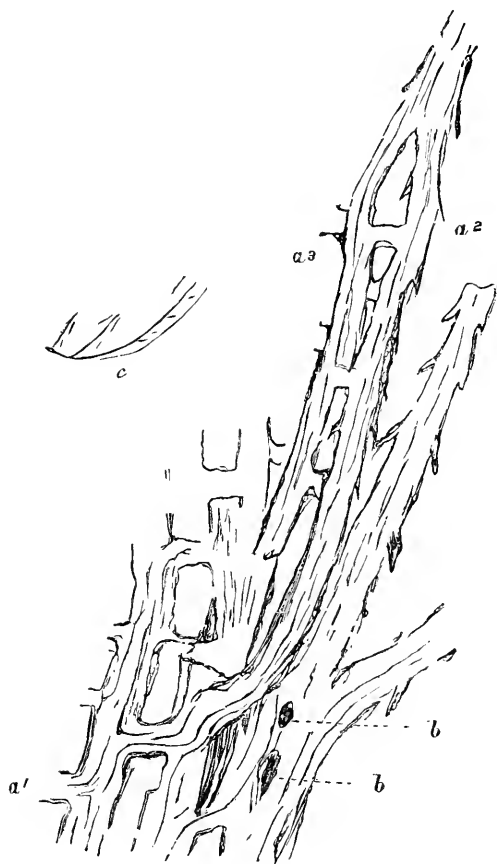


Fig. 181.—Spiniferous processes of *Fenestella plebeia* (M'Coy) † Halkyn, North Wales; *a'*. Basal origin of spine *a2*; *a3*. Fenestrules of the polyzoary; *bb*. Imperfect fenestrules; *c*. The way the spines rose up in the undisturbed shale.



Fig. 182.

Fig. 183.

Fig. 184.

Spiniferous processes.

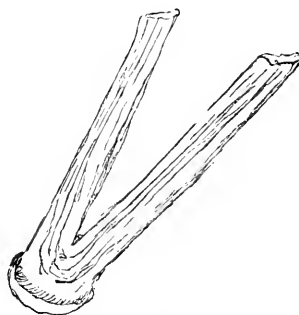


Fig. 185.—*Palaeocoryne radiata*.

of reproducing some, kindly furnished by Mr. John Young. Fig. 46 (SCIENCE-GOSSIP, March 1879), is a sketch of a branching spiniferous process *in situ*, on a frond of *Fenestella* from Cragenglen Campsie. It is four times the natural size, and it is one of the most beautiful processes from the poriferous face that I have ever seen. In Mr. Shrubsole's collection there is another fine specimen of spiniferous process springing from the back of the frond, altogether

are of a different character to the others. I have given all that my section now shows. Before I rubbed it down these branches were prolonged considerably, not on the same plane as the part that is shown in the fig. 181, but they penetrated through the shale something like what is shown at (*c*), and they bent from the poriferous face upwards. At (*bb*) two partially developed fenestrules are shown. I cannot trace any remains of zoecia in these branches and there is no hollowness. The character is that of a solid spiniferous shoot. The figs. 182 and 183 are from specimens from Richmond, and fig. 184 is enlarged to show the special character of the hook.

There is a specific value belonging to these spines, which in all future diagnoses of species will have to

be considered. In *F. plebeia* the recurved spines have double characters, one thickly, and the other sparsely set. In some doubtful species of *Fenestella*, both in Scotland and in Hurst, the recurved spines are strongly fluted. In *F. membranacea* the fluting is finely beaded, and in *F. nodulosa* the spine is distinctly characteristic. I have used the typical character of the spine as given by the Messrs. Young most effectually in my investigations, and although in some parts these may vary, the differences are perceptible when closely examined.

It may now be asked, since there is no analogy to guide us, what were the purposes the processes (Palæocorynæ and spiniferous) were intended to serve? The answer is not an easy one. I have attempted in my essay to unfold a mystery, but as this part of my writing has created opposition from several able specialists to whose decision I for the present bow, I withhold my speculations till others, abler than myself, will take the hint now furnished, and give a more philosophic view than it lies in my power to do. The conclusions I arrived at will have to be faced by specialists, and no one will be more pleased than myself, if my views are proved to be crude or erroneous.

I now leave the question as to the mode of development of the whole of the Fenestrate Polyzoa of the Palæozoic era to the unprejudiced judgment of the palæontologist. When I began the study, I never thought that the investigation would have taken me into so many of the by-ways of life; but, bit by bit, the great mystery which had hitherto enveloped these forms began to unfold itself, and for months past my mind and thoughts have been occupied, and my leisure time devoted to an endeavour to comprehend the secret of this particular life.

Many of my specimens I have been obliged to prepare in a very novel way. In reducing to transparency many of these sections of shale, I came across peculiar aspects of the spines and Palæocorynæ, these I had to draw before I reduced the section further; so, bit by bit, I was able to piece in as it were the whole idea of the spine. Then this would follow the fate of the other views, and so on, till I could trace right into the heart of the branches and dissepiments, the ramifications of the spiniferous process. This was the case with fig. 181, but I have faithfully followed the processes and the Palæocorynæ, neither putting down less nor more than what I saw. Every figure therefore is true to nature, and if they be not so artistic as I could wish, they have in their unartistic roughness all the truth as it appeared to me.

Note.—I shall be happy to communicate with any students of the palæozoic polyzoa who desire exchanges for study, and I should also be glad to examine any *Fenestella* they may entrust to me if sent direct by post.

Attercliffe, Sheffield.

NOTES ON A CURIOUS MITE (*CALYPTOSTOMA HARDY*).

THIS very curious mite was found by Mr. Hardy in the Cheviot Hills, and described and figured by Mr. Cambridge in the "Annals of Natural

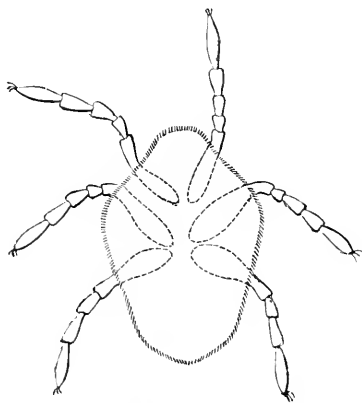


Fig. 186.—Outline of nymph of *Calyptostoma*.

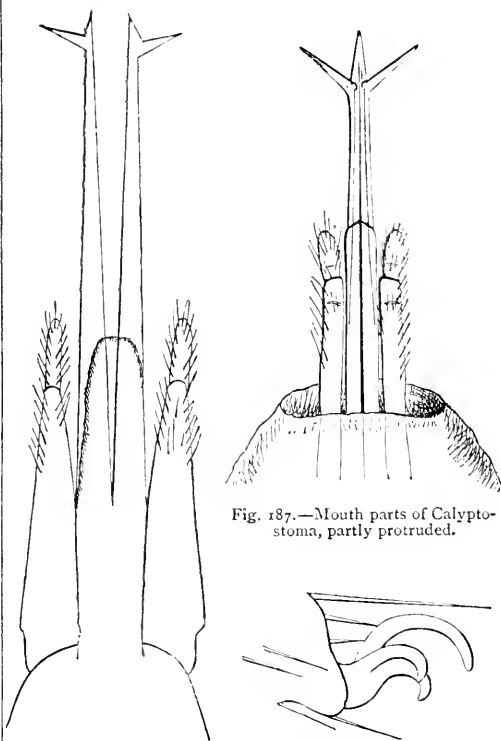


Fig. 187.—Mouth parts of *Calyptostoma*, partly protruded.

Fig. 188.—Mouth parts fully protruded.

Fig. 189.—Tridactyle tarsus of nymph (highly magnified).

History" for 1875. The description is minute, and very good, excepting where he says that the upper surface is "very convex." As his specimens were not

living ones, I attribute this convexity to endomose, due to the preservative solution in which they were probably kept. During the present year I have found three or four living specimens, and all these were rather flat and wrinkled, just like *Trombidium holosericeum*. Mr. Cambridge says that the "mouth parts are

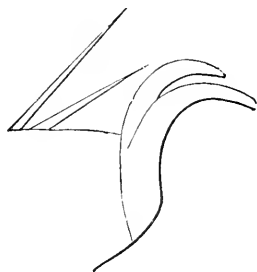


Fig. 190.—Didactyle tarsus of mature mite (highly magnified).

apparently very minute, and concealed in a deepish circular cavity at the extremity of the forepart." He also says that the structure could not be ascertained by the magnifying power at his disposal. I therefore thought that it would be acceptable to some of your readers to have a sketch of these mouth parts, which are indeed very remarkable, beautiful, and entirely different from any other mite, whose mouth I have had the opportunity to examine. At first sight the creature appears to have no mouth organs; there is, however, on the under side of the forepart, a pit, or depression, and when the mite is placed in a compressorium, and graduated compression applied, the proboscis emerges by degrees. Fig. 187 is a drawing of these parts when partially protruded; and fig. 188 the same after sufficient pressure has been applied, not only to completely evert the organs, but also to separate the component parts; the figures are sufficiently clear without description. I found the mites whilst searching for beetle-mites amongst moss, and rubbish taken from the decaying roots of trees in a fir plantation.

In March 1878, I found what I now believe to be the nymph of this creature; it has six legs, and each tarsus is supplied with three claws, the central one being much larger than the other two. When I first found it, I took it to be the nymph of a *Trombidium*, and did not examine it sufficiently whilst it was alive. It is a very curious circumstance that these mites should have tridactyle tarsi when in the nymph stage, and didactyle ones when fully developed; whereas, in many of the beetle mites, the nymphs have but a single claw, and the perfect creature possesses three. I send an outline sketch of the nymph, from one of my mounts; also the claws of nymph and perfect mite, highly but equally magnified.

Kirton Lindsey.

C. F. GEORGE.

COSSUS LIGNIPERDA AND LITHOSIA QUADRA.—I took two *cossus* at sugar here on the 9th of August last, and one rather battered female *quadra*, while flying round a lamp-post, on the 14th of same month. The latter is, I believe, generally considered a New Forest species.—*J. R. Edwards, Stratham.*

ON THE SCIENTIFIC VALUE OF MICROSCOPIC PREPARATIONS.

THE following remarks in a letter of Dr. Pelletan ("Journal de Micrographie," 3^e année, No. 3, p. 139) on microscopic preparations will be appreciated by those who use the microscope as an instrument of scientific research rather than a superior kind of toy requiring the aid of pretty objects to make it interesting; and it may moreover console those who have neither the leisure nor the manipulative skill to arrange diatoms, butterfly scales, sponge spicules, &c., in elegant patterns. The selection of Diatoms, Polycystins or Foraminifera, when very scarce in a gathering is perhaps desirable, and the preparer may always learn more of the structure and contour of the objects by selecting and transferring them to a clean slide than by merely mounting them with the extraneous matter contained in the gathering, but there is no advantage in arranging them in elaborate patterns. We will now hear what Dr. Pelletan says about them.

"You complain, in your letter, of the little scientific value of the majority of microscopic objects prepared for sale, and you have good reason for doing so. With the exception of a few these preparations are insignificant. They are often very beautiful in appearance, mounted on the choicest glass in an irreproachable cell, with varnishes of all colours, the labels of every shade, and are very elegant to look at; but the object they contain is worthless. The preparations of diatoms are alone, for the most part, satisfactory, often excellent, and sometimes marvellous. All the world is acquainted with the preparations of diatoms of E. Wheeler, A. C. Cole & Son, and above all of J. D. Möller, whose 'Typenplatte' is a veritable *chef-d'œuvre* of patience and manipulation. Certain preparations of cryptogamic botany are also of some value, as sections, dissections, &c., of vegetable anatomy, thin cuttings of dense substances, animal, vegetable, and mineral, and particularly sections of wood are all very instructive, but of all other classes of preparations whose nomenclature fills the catalogue, it is only by chance one meets with an interesting slide.

"From what you have said I perceive that you are occupied with microscopic anatomy, and more especially that of insects. But histological preparations, whether normal or pathological, whether of man and other vertebrates, or of the invertebrates, are precisely those of the least value.

"Of the Arthropoda, among others, the preparers limit themselves to amputated feet, heads, antennæ, tongues, stings, &c., mounted in balsam, and behold the result. Others, more ingenious, mount large insects or immense spiders entire, after having emptied them of their contents, and these preparations have really a magnificent appearance. But, alas! the integument is all that has been preserved, and the little that remains of the internal organs is

represented by a uniform transparent mass in which the microscopist finds nothing to study, and in all the smaller kinds of insects they are also in a more or less transparent condition containing more or less opaque masses, covered with a well-preserved integument and to this state they are reduced by the preserver.

"In England we sometimes find preparations that are mounted without pressure; in these the insect is placed in the middle of a thick mass of balsam after having been impregnated with some essential oil to render them transparent, and not being pressed they are not deformed.

"Some of these preparations are very successful, particularly those of spiders; we can also perceive the remains of the internal organs, the muscular system, for example. I have also made a good many of them, but although they possess some advantages, their thickness (sometimes several millimetres) prevents their being studied with objectives of a short focus.

"I would not say that all preparations which I call trivial are useless: most certainly not. If they are not satisfactory to *savants*, they interest *amateurs*, and they teach many things that otherwise would not have been known. They are also useful in England, where they are sold in large numbers, because among our neighbours the microscope is more used for amusement and as an object of luxury than for working purposes.

"The young 'misses' in the drawing-room are better amused with, and, I believe, more usefully employed, in admiring the delicate little comb that forms the claw of a spider's foot, or the elegant little scales that enamel the wing of a butterfly, than in examining the insipid portraits in a keepsake.

"These slides, that for us have little interest, are therefore in this point of view of real utility. They give to ordinary people the taste for natural objects, and they furnish a thousand little instructions acquired without labour, and are also amusing. We must, therefore, not too much despise them.

"How is it that preparations of diatoms are always satisfactory? Primarily, because they are in reality the most easy to make. The diatoms relatively require but little manipulation to prepare them for mounting, and in consequence of their beauty the study of these little organisms has largely increased. The preparers are, therefore, all more or less, diatomists; they know what to do, they know how the object ought to be mounted. Certain vegetable organs are also well displayed, as there the preparer also knows how best to mount them as trachea, stomata, ovules, spores, organs of fructification, &c. But when they attempt animal anatomy, whether that of the vertebrates or invertebrates, whether normal or pathological histology, the preparers, with very rare exceptions, have not sufficient knowledge to know what is necessary to make visible, what is the characteristic detail he should render

evident in order to make the preparation instructive. They imagine it to be sufficient to take a piece of tissue, injected or otherwise, harden it, make longitudinal and transverse sections, then steep it in carmine, mount it in a beautiful cell, and by these means obtain a slide useful for something. This is a grave error. For example, I have before me various "commercial" histological preparations, disassociated muscular fibre, a torn nerve filament, a slice of conjunctive tissue, the nerve terminations on a muscular fibre. What do I learn? The muscular fibres have not been stretched. I do not see sarcolemma made evident, nor the nodes, nor the least detail of the strie, discs, and transparent spaces.

"The nerve filament shows me some little clotted threads scattered in the midst of a small cloud of conjunctive tissue, but of the myaline sheath, the cylindrical axis, the annular constrictions of the nodule of the segments of the endothelial cells (I do not speak of sections) I see nothing of all these.

"In the connective tissue I look in vain for a distinct element, the connecting fascia, and the elastic fibres, all is confusion, and the conjunctive cells are absent. In the nerve terminations on muscular fibre, I see a small yellow patch on the fibre; this is the motor plate, but the sheath, the ramifications, the nodules of various kinds, are all invisible.

"You will tell me that of all specimens, histological are the most difficult and tedious to prepare, and that it is generally impossible to show all these details in one preparation. This is true, but it is only a secondary reason. These difficulties are overcome by the facility given by practice.

"If one wishes to see all the details of structure in any particular organ, it is necessary to make many preparations. Alas! as I before remarked, preparers, with very few exceptions, have not sufficient histological knowledge, and are ignorant of the necessary technical methods, or even the will, because they are tedious and delicate, and they moreover fear that the increased cost of these preparations would frighten those who might wish to acquire them. I believe there is no foundation for this last reason, and I judge from the daily demands for preparations made on these principles, even at an increased cost, when they are really instructive, and I cannot doubt it when I see the most common specimens of *Pediculus pubis*, sold in America for 5 fr. 75 c., in which country it is not rarer than in France."

ECHIUUM VULGARE is not so uncommon in our neighbourhood as your correspondent T. Comlidge supposes. It grows in large masses on the beach between Portslade and Cliftonville, on the road from Bramber to Shoreham, and many other spots, but it does not generally make its appearance on the Downs, except in basin-shaped holes, where it sometimes attains considerable dimensions.—*Benjamin Lomax.*

THE HISTORY OF *RANATRA LINEARIS*.

ON the excursion of the Hackney Microscopical and Natural History Society, held June 28, I captured a pair of that interesting aquatic insect the *Ranatra linearis*, and having since had the good fortune to breed from them, I venture to submit to you the following short observations. To watch these insects feed, and their mode of taking their food, I placed them in an upright glass aquarium with plants of *Vallisneria spiralis* and common frog-bit—this was on June 28. On July 7, I was much surprised to find the leaf of frog-bit exhibiting a most unusual appearance—as shown in fig. 191. The

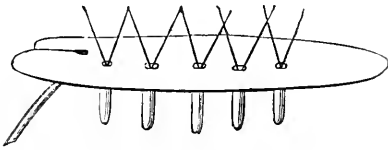
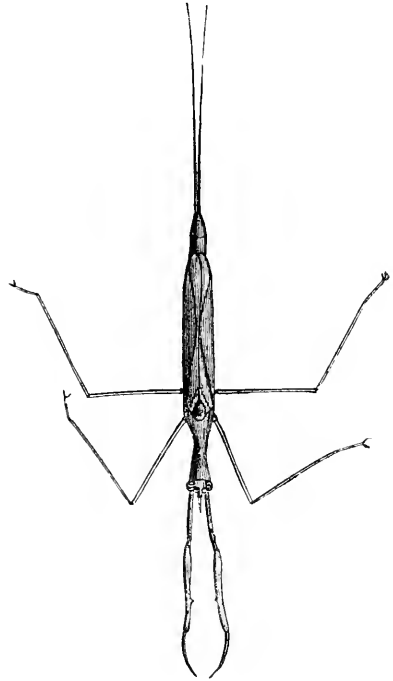


Fig. 191.—Eggs deposited on leaf of Frog-bit.

Fig. 192.—Single eggs and young of *Ranatra*.

best verbal description I can give of this appearance is, that the floating leaf appeared on the top to possess the antennæ of some moth, to which underneath was attached a small substance, something in shape like a canary-seed, but more rounded at the extremities, especially at the end from which these antennæ or appanages sprung. The leaf had evidently been pierced, the appanages thrust through when they opening into a V-like shape, kept the underneath substance from falling. I was much puzzled by these appearances, and being quite ignorant of what they were, called in one or two friends to see them, in the hope of acquiring information; but being unable to get any I the more anxiously watched and almost came to the conclusion that they were the germs of some botanical production. The leaf of the frog-bit from some cause or other decaying they gradually sank, the same V-like appanage which had kept them in their position now keeping them from falling too fast or from sinking in the soft mud at the bottom of the aquarium; here they remained in a perpendicular position and were watched from time to time. On August 4, I was delighted to find four young *Ranatra* swimming freely about (see fig. 192). They were about half an inch in length, and in form so like the parents it was impossible to be deceived. On the 5th another was added to the number, which the elder ones

instantly devoured while it was yet in a helpless condition. I should think the first must have been hatched on August 3, although I did not see them until the 4th, they were so strong and well-grown when first observed, whereas the fifth, which must have been seen directly after its development, was a poor little pink thing with large black eyes, and soon became a prey to those of yesterday. The appearance of these young *Ranatra* led to the discovery that the objects on leaf of the frog-bit which had so puzzled me were the ova of this insect, for I found them all on the bottom of the aquarium quite empty, with an opening in the end between the antennæ or appanages, so I come to the conclusion that when I took

Fig. 193.—Full-grown *Ranatra* (natural size).

the adult *Ranatra* on June 28, they were in copulation, that the ova were deposited on July 6 or 7, and the puny insect developed on August 4 and 5. These times may of course vary according to circumstances, I only speak from personal observation. I cannot help thinking what an interesting sight it must have been to have watched the insect depositing the ova, how the leaf must have been pierced, the ova extruded, the antennæ—if they may be so called—being thrust through the perforated opening, on which they must have immediately sprung into a wedge-like shape—opening wide at the top—to keep the ova in position. How long it takes the young insect to acquire maturity I cannot say, probably some twelve months; unfortunately all mine perished, the greater part being devoured by their brethren,

the remainder I am afraid from lack of proper food. When first hatched the young ones are perfect, with the exception of the ova depositor which is not fully developed, when this is acquired is a subject for further investigation. The full-grown insect, as shown in fig. 193, is some three and a half inches in extreme length, it is furnished with four legs and two front feelers; these cannot be called legs, for they seem to be used for no other purpose than catching the prey; they are furnished with two hard horny joints at the end, with which they seize their food (see fig. 194); in this respect nothing seems to come amiss, the young ones I have seen as well as the old, feeding on various daphnia, cyclops, &c. I am sorry to say they devoured all my *Actinophrys sol*, bred in the same

as it were the progress. These feelers or legs consist of two joints, the first can only be moved upward (see fig. 194) the second joint can only be moved downward and is often folded directly under the second joint, so much so that there then appear only two joints—the whole is capable of being thrown out in quite a horizontal position, as fig. 193. So in this front leg or feeler we have two joints, each with quite a separate action, but both moving in unison to the desired object. I hope these few remarks, made from personal observation, will be the means of exciting further research into the life-history of this extremely interesting insect, relative to which I shall be glad to receive any information.

COLLIS WILMOTT.



Fig. 194.—*Ranatra linearis* in the act of catching insects.

aquarium, while one of the old ones seized and destroyed a full-grown tadpole of the frog; they will really devour anything. As my readers are well aware, the *Ranatra* belongs to the *Nepidae*, and is closely allied to the water-scorpion. It appears, like that insect, to have wings, but from fear of hurting my specimens, I have not been able clearly to make this out, and shall be glad of any information; if so they are very hard to unfold and can be but little used. It feeds on suction—the prey being seized by the strong claspers, attached to the front feelers or legs, and drawn up close for the horny and beak-like proboscis to be thrust into it, with which the life of the victim is sucked away. When handled, the insect often feigns death; when it crawls, as before observed, the four legs are only used, although I have seen the front feelers thrown round a plant or stem to assist

THE HISTORY OF THE APPLE-TREE.

By H. G. GLASSPOOLE.

[Continued from p. 223.]

THE varieties of apples are so many, and several have interesting histories attached to them, that it would be impossible within the limits of this paper to give an account of them. I will only mention one or two of our most well-known kinds. The earliest apple that ripens in our country is the jounneting, or gennetting, a small, pale yellow, sweet tasting fruit; it is a very old variety, and is mentioned by Evelyn in 1660, and described by Ray, 1688. There are various opinions as to the etymology of the name. Dr. Johnson has written it gineting; while some country people and the Americans call them juneating apples. In the old Latin writings they are termed joannina, no doubt from their becoming ripe about St. John's Day (June 24th). One of our best eating apples is the ribstone pippin, which an American writer says stands as high in Britain as the Bank of England, and to say that an apple has a ribstone flavour is there the highest praise that can be bestowed upon it. (A. J. Downing's "Fruit and Fruit Trees of America.")

The original tree sprang from some apple-pips brought from Normandy at the close of the seventeenth century; they were sown at Ribstone in Yorkshire, five of the pips grew, two producing crabs, the other apples, one of which was the famous pippin. The original tree is supposed to have been planted in 1688 and stood till 1810, when it was blown down, but being supported by stakes in a horizontal position, continued to produce fruit until 1835, when it lingered and died. This apple was some years before it attained its popularity, for at the end of the last century it was little known, as is shown by the fact that in 1785, and for some years afterwards, no more than twenty-five plants per annum of this tree were grown at the celebrated Brompton Park Nursery, whereas, in 1851, about 2500 plants were annually sent out thence (see Mrs. Burnand's

Common Fruits). It is generally to be met with in almost every large orchard in the kingdom. Norfolk has long been famous for apples; some account of the best varieties peculiar to or cultivated in that county by Mr. Lindley, will be found in the *Horticultural Transactions*, vol. iv. p. 65. The Norfolk Beaufin, or Beefin, Lindley tells us, is undoubtedly a Norfolk apple. Independently of its general use in the kitchen, it furnishes a luxury for the table as a sweetmeat; great numbers used to be prepared at Norwich by drying them slowly in baker's ovens after the bread had been drawn, and pressing them with the hand to flatten them till they are perfectly soft and are of a deep, rich brown colour; they were then packed in boxes and sent to London and other parts of the kingdom, where they were considered a great delicacy. The Horsham russet is another Norfolk apple, and raised from the pip of a Nonpareil by a Mrs. Goose, of Horsham, St. Faith's, Norwich, many years ago. The apple, as an article of food, is probably unsurpassed for its agreeable and nutritive properties. Our forefathers believed the fruit to be something more than to fill an empty stomach; they also commended it in "splenatick" and melancholy disorders. John Key, better known as John Caius, the Court physician to Mary and Elizabeth, had a high opinion of the fragrance of apples in a sick-room, for he recommends them in one of his works to patients recovering from a "sweetynge sickness," if they found their strength wasted, "for," adds the doctor, "there is nothing more comfortable to the spirits than good sweet odours." Another old English writer of 1657 tells us that those pleasanter kinds of pippins and pearmanes being roasted and eaten with rose-water and sugar, are helpful to dissolve melancholy humours, and to expel heaviness and promote mirth.

Pomatum owes its name to apples. In a work called "*Secreti d'Alessio Piemontees*," by W. Ruscelli, an Italian, published in the sixteenth century, there are several formulæ for making pomatum, in which pippins form the principal ingredient. Gerard, in his herbal, states that the pomatum in his time was composed of the pulp of apples beat up with swine-grease (lard), and rose-water. The wassail cup our forefathers used to indulge in on All Hallow eve, and the eves of church festivals, called lambswool, was composed of apples toasted on a string until they dropped into a bowl of hot spiced ale, placed ready to receive them, and they gave great softness to the beverage. Lambswool is thus etymologised by Vallancey. "The first day of November was dedicated to the angel presiding over fruits, seeds, &c., and was therefore named La Mas Ubhal, that is the day of apple fruits, and being pronounced lamasvel, the English have corrupted the name to lambswool." The various ways in which apples are cooked is well known. "A Hundred ways of Cooking Apples" was one of the cheap popular books one used to see on the bookstalls not many years ago. Perhaps the most

staple form in which it appears in this land of solids is the apple dumpling. Coleridge said that no man has lost all simplicity of character who retains his fondness for apple dumplings; let us hope this doctrine is still true, for in some countries an apple dumpling with a piece of bacon or pickled pork in it, forms the staple of the mid-day and evening meal of the agricultural labourer. It is said that King George III. was once greatly puzzled to know how the apple got into the dumpling. Most of the old-fashioned farm and manor houses in this country possess large orchards, which contain more of these fruit trees than any other. Dr. Johnson gave the following advice to one of his friends. "If possible," said he, "have a good orchard. I know a clergyman of small income who brought up a family very respectably, whom he chiefly fed on apple dumplings."

Hogg remarks, in his work on apples, that it has existed as an indigenous tree throughout all ages, and that the most ancient varieties were accidental variations of the original species with which the forests abound. In its wild and uncultivated state, the apple is known in this country as the crab; by some authors it has been supposed that the garden apple is not an improved crab, but rather the crab is a degenerate apple, and that it has an Eastern origin (See Prior's "*Popular Names of British Plants*"). As to the Eastern origin of this tree, Professor Koch spent much time between 1836 and 1844 in Armenia and the adjacent countries investigating the subject, and the results of his studies and inquiries led him to believe that the apple never grew wild anywhere south of the Caucasus. The celebrated traveller Van Buck, remarks that the apple will grow in the open air wherever the oak thrives, thus it is found as far north as lat. 60° in western Russia. The crab of Europe is wanting in Siberia, but the Siberian form of the species is widely distributed over the country.

The people of Lapland showed Linnæus what they called an apple-tree, which they said bore no fruit because it had been cursed by a beggar woman to whom the owner of the tree had refused some of its produce. The naturalist found that it was the common elm, a tree also rare in that severe climate. The apple is stated by Royle to be cultivated in the southern parts of India, also in the Himalayas, and in China and Japan, but it is not indigenous to the warmer parts of these countries. As an instance of the difficulties attendant on the introduction of European plants into the north of India in former days, it is stated by Mr. Royle, that an apple-tree from Liverpool, in consequence of being the only one that survived, cost upwards of £70 before it was planted in the nursery at Mossuree. Apple-trees were introduced into America by the early settlers, and were first planted on an island in Boston Harbour, which still bears the name of Apple Island. The Indian tribes helped to spread this fruit through the country, and nowhere does it flourish better than in the land of

its adoption, the United States, from which large quantities packed in barrels and preserved in tins are sent to England every year. Some years so plentiful is the crop in many parts, that it has become a practice to employ the surplus of sweet apples in fattening pigs, &c. Perhaps one of the most delicious of the dessert apples which stands at the head of the list of American-grown fruit is the Newtown pippin, and which certainly fetches a higher value in Covent Garden market than any other kind. One of the finest orchards in the New World on the banks of the Hudson contains more than 2000 of these trees. The Siberian crab apple was not cultivated in Britain until 1758, and the small fruited variety was introduced in 1784; this tree is often planted as an ornament in our shrubberies.

(To be continued.)

MICROSCOPY.

HOW TO REMOVE AIR-BUBBLES.—Air-bubbles, whether in balsam, glycerine jelly, or fluid mounts, are a constant source of annoyance to the amateur mounter. I will endeavour to show how these pests can be avoided. Firstly, with respect to balsam. Mr. Stokes, some months since, gave a plan which will answer in very many instances; but there are objects which will not stand the boiling recommended by Mr. Stokes, in such case the air can be got rid of by immersing the object in boiled water still lukewarm, and changing the water every two or three hours until the air is wholly displaced (boiled water absorbs air most greedily). The object is then transferred from the water into alcohol, absolute alcohol and oil of cloves in succession, allowing it to remain a sufficient time in each to displace the water or other fluid; the object can be mounted in balsam direct from the oil of cloves. The difficulty with glycerine jelly is that it begins to thicken immediately it is put on a cold slide, and when the cover is put on, air-bubbles are almost sure to be enclosed. The way to obviate this difficulty is to have the glass slip lying upon something heated to 150° or thereabouts, such as a hot-water plate or block of iron taken out of an oven; by these means the jelly is kept fluid whilst the object is being mounted; the cover must be breathed upon on its under surface previously to being lowered in its place; as soon as this is done the slide can be removed from the heated plate or iron, and the jelly allowed to set. It merely requires ordinary dexterity to mount an object in fluid in accordance with instructions given in works on this subject, but it certainly is an annoyance to an amateur mounter to find bubbles making their appearance when he knows that none were to be seen when the object was first mounted, and that the cement was good and reliable and properly applied. The question naturally arises, where do the air-

bubbles come from? I have seen this attempted to be accounted for in several ways, but not to my satisfaction. The true explanation is that the preservative fluid itself contains "free" air; expel the air before using the fluid, and no bubbles will afterwards make their appearance providing the other part of the mounting be properly carried out. To expel the air from the preservative fluid, all that is necessary is first to fill the cell well with fluid and to place the slip upon a hot-water plate or heated iron; minute bubbles will shortly appear and can be detached from the bottom and sides of the cell by means of a bristle; they will collect at the top of the fluid and can be removed by just touching it with a little blotting paper; the slide must then be taken off the heated surface, the object immersed in the fluid and the cover put on and fastened in the ordinary way. If all be done properly no bubbles will afterwards be seen; on the contrary, I have at times actually enclosed a little air by accident when putting on the cover, which air has afterwards been absorbed by the fluid.—*H. M.*

STAINING FLUIDS FOR VEGETABLE TISSUES.—For some time past I have thought it rather "hard lines" upon the microscopical botanists that but one staining fluid has been used at a time. I have, therefore, tried several experiments with different fluids, and I am glad to say I have at last found out a most successful method of staining one section with two fluids. The way I now stain all my sections preparatory to mounting them is this: the section is first immersed in an aqueous solution of Crawshaw's aniline blue dye (strength, 1 per cent.). It is then removed into strong acetic acid, which seems to fix the colour in certain tissues, remove it from others and prepare that not stained for the reception of another colouring fluid. It is then again removed and put into a weak solution of magenta (Judson's dye), also made strong with acetic acid; then mounted in glycerine jelly. I find this such a beautiful and instructive method of staining (as it completely shows the "differentiation" of parts, both by the different colours and also the various intensity of colour) that I venture to ask room in your paper for its insertion, in order that others may be made acquainted with a system so simple, yet, which has cost me much trouble and many failures. The following are the colours with which the tissues of a section of Burdock are stained:—

Pith	Very pale magenta.
Cellular tissue	Deep magenta.
Spiral vessels of medullary sheath	Deep blue.
Fitted vessels	Blue.
Cambium	Deep blue.
Liber cells	Dark magenta.
Latiferous vessels	Deep blue.
Cuticle parenchyma	Pale blue.
Epidermis	Deep blue.
Hairs	Pale magenta.

—*Albert Henry Barrett.*

HOW TO RESTORE MICROPHOTOGRAPHS.—In reply to Mr. H. Heasman's inquiry I beg to inform

him nothing is easier. They are mounted in balsam. All he has to do is to heat the slide on both plates just sufficiently to remove the covering glass. If by chance the photograph comes up with it apply a little turpentine or benzole (I forget which I used) to free it; transfer to clean slide and remount in fluid balsam.—*Fred. H. Lang.*

NEW ROTIFERS, &c.—In addition to the two Entomostraca found at Olton, new to this country, a rotifer only recorded lately in America has been found there, and a *Peridinium (ceratium)*, only found previously in salt water. I made a rich gathering recently of *Lacinnularia socialis* and *Cristatella mucedo*, &c., and send you a specimen of the former.—*Thomas Bolton.*

EUGLENA VIRIDIS AND ITS BULBED FLAGELLUM.—It may, perhaps, interest Mr. Robson, to learn that I have seen all the forms of Euglena sketched by Mr. Harkus in October issue of SCIENCE-GOSSIP, though I do not, of course, claim to be the first observer of the peculiarity of the bulbed flagellum. Neither do I claim to have settled the question of the metamorphosis of the Euglena. Nevertheless, it is a very singular coincidence, that two observers, altogether unknown to each other, should witness independently a precisely similar phenomenon; particularly so, if the suspicion at which I hinted in my letter of August last have no foundation in fact, and be erroneous. Ehrenberg studied the life history of *Hydratina senta* very fully; would not a reference to his work tend to throw some light on this point? From a circumstance I observed a few months ago, I am led to believe that the bulbed flagellum is not a necessary appendage to the Euglena. On one occasion, whilst closely watching the contortive movements of a full-grown specimen, I was much surprised to see the little animal “bite off,” if I may so term it, the flagellum, which immediately floated away. Its absence did not appear to cause the Euglena to suffer any inconvenience, for it still continued to disport itself with as much activity as previously. Mr. Robson mentions the absence of the bulb from the flagellum of No. 1 sketch of mine in the August number of SCIENCE-GOSSIP. I noticed the same omission, but suspecting it to be the result of the block having been damaged, I did not consider it of sufficient importance to need any remark from me in the September number correcting it, as I stated so plainly that *all* specimens which had come under my observation possessed the bulbed flagellum. If Mr. Robson has a few specimens of the Euglena gathered by him, and would send them to me I would willingly defray cost of postage; and as I expect shortly to be in the neighbourhood of Preston, I will endeavour to obtain and send to him a sample of Euglena, similar to those I originally examined; such exchange, if practicable, will serve either to establish the identity or dissimilarity of the two gatherings.—*F. J. George.*

CLEANING OLD SLIDES.—The easiest way I find is to warm slide and push cover into sulphuric acid, then put slide into a strong solution of common washing soda and boil for an hour or so. All varnish or cement may then be scraped off with an old knife with ease. Then wash all traces of soda away in clean water.

LEPTODORA HYALINA.—It is with much pleasure that we put ourselves and our readers right on a matter of fact. Mr. H. E. Forrest (to whom we ascribed the honour of first finding Leptodora in England), with characteristic fairness, writes to us stating that it is not to himself, but to Mr. J. Levick, a member of the Birmingham Natural History and Microscopical Society, that the honour of its discovery is due.

ZOOLOGY.

THE ICELAND FALCON (*Falco islandicus*).—A fine young bird of this species in beautiful plumage was captured in the Queen's Park, Edinburgh, about the end of August last, under the following circumstances: While Mr. R. B. Gilroy was walking there with some friends, he saw some lads striking at an object in a furze bush, and, on approaching, found it to be a bird of prey; stepping forward, he, with the assistance of his friends, secured it. As the Queen's Park is largely taken advantage of as a pleasure resort, they were soon surrounded by a curious crowd conjecturing what kind of a bird it was. One thought it was a hawk, another knew it was a falcon, a third declared emphatically it was an eagle, while a fourth was equally certain it was a parrot. Mr. Gilroy now procured a cab and drove home with his captive, for which he soon extemporised a convenient cage. But the bird looked dull and would not eat, and Mr. Gilroy thought it must either be exhausted by a long flight, or seriously ill, as it made no attempt to fly when captured; accordingly he called in a doctor, who forthwith administered a dose of castor oil, which had a wonderful effect in reviving the drooping spirits of the bird. It soon began to eat greedily, and was so tame when I saw it twelve days after capture as to eat meat out of the hand. So far as I am aware, there is no record of this species having been previously captured or shot near Edinburgh.—*David Douglas, Leith.*

HOW TO PRESERVE LARVÆ.—Having seen in your journal an article on preserving larvæ, I thought a few hints as to the plan followed by myself might be of use. The larvæ are killed, and the intestines removed in the same manner as described in your paper, but, before killing, I keep the larvæ without food for a couple of days, as if operated upon whilst full of vegetable matter, it leaves a black stain just behind the head, which spoils the look of the larvæ. In

preserving the skins, I use a glass tube bent as shown, and drawn to a fine point, the upper side of the point being straight. The skins are held upon the tube by means of a fine steel spring, tied to the tube; they are then blown out with the breath and dried over the flame of a common paraffin lamp, care being taken to keep them distended with the breath whilst drying. The bend in the tube is to prevent any moisture from the mouth entering the skin; when

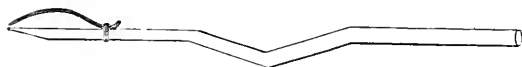


Fig. 195.—Tube for preserving Larvæ, length about 18 inches.

quite dry they are easily detached from the tube and mounted with gum upon stems of grass, or twigs. The hairy larvæ are soaked previous to drying in alum and water to keep the hair from falling off. To test when properly dried, the air has only to be exhausted from the tube, and the part of the skin not dry immediately doubles up. This is a simple method, and necessitates the use only of the one tube.—*T. W. Harris.*

URTICATING MOTHS.—It may not be generally known that the imagines of *Liparis auriflua* and *chrysorrhæa* possess the same urticating properties as the larvæ. One day last August I was conveying a gold-tail, which had just emerged in my breeding-cage, to the poison-bottle, and in doing so let it fall up my arm—between the flesh and my shirt-sleeve. It remained there but a second, as I immediately gave a shake and got it down again without any damage to the moth; but in less than ten minutes my arm looked as if stung with nettles, and the irritation, which was almost unbearable, continued for nearly two hours. About this time my brother, Mr. Arthur Anderson, of Salisbury, captured a gold-tail, which he carried home in his hat. Like myself, being unacquainted with the poisonous nature of the perfect insect, he was surprised to see his forehead covered with little bumps, causing an intolerable itching. So bad was it that he went to a medical man for advice, who told him he must have checked the perspiration, and accordingly gave him some medicine. Mentioning the circumstance one day to him of the moth falling up my sleeve, and the effects, he exclaimed, “Then that accounts for my forehead.” In the summer of 1876 the hedges by the side of our canal were absolutely swarming with the larvæ of *Liparis chrysorrhæa*, and, strange to say, I experienced far greater discomfort after the moths had left the cocoons, as I could scarcely walk by the hedges without face, neck, and hands suffering severely, and I dared not beat them for moths for months afterwards. The reason of this may possibly be, that as the moths emerge the hairs which are so plentifully used in the construction of the cocoons are set free. Surely there must be some poisonous property in the hairs, the

simple penetration of the skin could not cause such discomfort; and again, many hairy caterpillars, such as *Acronycta Aceris*, the *Arctia lubricipeda* and *Menthastri*, shed all their hairs, and with them line their cocoons, and yet may be handled with impunity. In the case of the imago I am inclined to believe that the irritation is caused by the white hairs which fringe the inner margins of the wings and not the golden tail-tufts, as I have rubbed the latter over my hands with no unpleasant results. I have bred specimens this year of *Liparis chrysorrhæa* with spots on the forewings much blacker than *auriflua*, more like *Arctia Mentastri*, the insects in each case being males. Newman says of *chrysorrhæa*, “all the wings white,” and Stainton “satiny white, *spotless*, F. W., rarely with a black spot near the anal angle,” so that I imagine the presence of spots is somewhat uncommon. The beautiful larva of *auriflua* is well known, that of *chrysorrhæa*, though very abundant where it does occur, is far more local; singular it is that caterpillars so dissimilar should produce imagines of such close resemblance.—*Joseph Anderson, jun., Chichester.*

A SUPERIOR MODE OF KILLING INSECTS.—Dr. J. M. Eder has communicated to the Zool. Botan. Verein at Vienna (Verhandl. 1878, Sitzungsab. p. 19), a mode of killing insects, especially Coleoptera, which he has used for many years, and finds superior to others, inasmuch as its action is more rapid, and the colour, hair, or scales of the insects are not affected by other agencies. All that is required is a wide-mouthed glass bottle, having a cork fitted tightly: into the bottle are put some pieces of stout blotting paper, and on these three or four drops of bisulphide of carbon (Schwefelkohlenstoff); of this supply sufficient for the service of a day or two may easily be carried in a small bottle in the waistcoat pocket. When an insect is put into the bottle and the cork quickly replaced, death ensues instantly, or in the case of the largest beetles, within a few seconds, and the bisulphide, by reason of its volatile nature, being immediately vaporised, the insect is dry, and its condition in no way injured. Occasionally, if the bottle be often opened, a drop or two of the bisulphide must be added, in any case it is essential that the cork be replaced directly and firmly. The bisulphide is also very effective in exterminating *Ptinus fur* and *Anthrenus*, and it is further recommended on account of its being cheap and easily obtained.

RED SEA-WEEDS AND ANIMALCULA.—In the October number of the “Zoologist” (now one of the liveliest and best edited of our scientific journals), there is a capital abstracted translation of a remarkable paper by Dr. Dodel-Port, entitled “The Fertilisation of Red Sea-weeds by Animalcula.” This paper is an ingenious endeavour to show that the non-locomotive spores of such red sea-weeds as the Floridæ are

carried by currents much after the fashion that the pollen-grains are conveyed by the wind, and that such infusoria as Vorticella, by their attached positions on the sea-weeds, cause the spores to be deflected on to the female organs, and thus produce fertilisation. The theory opens up another remarkable chapter in the inter-relation of animals and plants, and shows that animalcula thus do for red sea-weeds, what insects perform for coloured and attractive flowers.

PARASITES ON HEDGEHOGS.—Hedgehogs are by no means exempt from these parasites and some forms of Acari—in addition to Ixodes ("X" of present No.)—may not unfrequently be taken from their bodies. Before me is one in my cabinet taken and prepared by my own hands a long time since, to add to my collection of animal parasites. The hedgehog had many, but I never observed signs of discomfort. At a cursory glance, *Pulex erinacei* might be accepted for *P. canis*. They differ, however, the specific characters of *erinacei* being—Head, naked. Mesothorax fringed. Tarsi, anterior, 5.2.1.3—4; posterior, 1.2.5.3—4. Considering the adaptability of means to ends, the peculiarities of the animal, and the uses of the flea in creation, I should consider it remarkably strange that the hedgehog should be deprived the benefit resulting from the habits of this parasite in its larval state, which I apprehend must far outweigh any inconvenience from the suctorial habit of its final condition, since hedgehogs are possibly less acutely sensitive of cuticular irritants, while pain and its effects seem modified by peculiarities of structure.—*J. Fiedarb, B. C.*

RARE CETACEANS.—In my note under the above heading in SCIENCE-GOSSIP for October, p. 233, by some error "white-beaked" dolphin is printed "white-scaled dolphin."—*T. Southwell.*

"THE POPULAR SCIENCE REVIEW."—Among the leading articles which appear in the last number of this popular serial are the following:—"On Jade and Kindred Stones," by Prof. F. W. Rudler; "Report on American Dredgings in the Caribbean Sea," by A. Agassiz; "The most Powerful Telescope in Existence" by E. Neison; "Flight and its Imitation," by F. W. Breary, &c.

BOTANY.

THE COMMON STINKHORN (*Phallus impudicus*) AND ANTS.—During the months of July and August, I met with several specimens of this noisome fungus, and became quite expert in discovering their whereabouts by means of the peculiar fetid odour arising from them, which, if once smelt, will not readily be forgotten. One fine specimen, which measured seventeen inches from the base to the summit, had its cap almost denuded of the dark slimy mucus which covers it, and from which the powerful scent princi-

pally arises, by swarms of ants, which were busily engaged upon what appeared to be to them a dainty feast. The ant-hill was thrown up around the bottom part of the stalk of the fungus, up which a stream of eager little insects was continually climbing to share in the banquet above, which they evidently enjoyed. I have, on one or two occasions, seen the cap of the stinkhorn covered with various species of flies, but never before observed ants attracted by it. I may observe that the stinkhorn is far from common in this locality, but the damp summer appears to have been favourable to its growth, for I have met with more specimens this season than ever I did before.—*R. Standen, Goosnargh, Lancashire.*

GEUM RIVALE.—I was much interested on seeing the notice of a monstrous form of this plant in a recent number of SCIENCE-GOSSIP. Departures from the normal form seem to be plentiful this year. One I came across seems worthy of notice as being useful to students of morphology. The calyx consisted of five ternate divisions quite distinct, having exactly the appearance of stem leaves, only smaller; the corolla had ten petals instead of five, the stamens were rather less in number than usual, and all perfect, carpophore long. The greatest change was in the pistil, which may be best described as an ordinary flower, with calyx, petals, stamens, and carpels complete and normal, except that the latter were sessile instead of on a carpophore, in fact it was a flower within a flower.—*W. Wise, Launceston.*

REGISTER OF FIELD BOTANISTS.—The suggestion of Mr. Arthur D. Melvin, as to the formation of a Register of Field Botanists, is a most excellent one, and I should think calculated to increase the interest of SCIENCE-GOSSIP. I should propose that a sort of "Natural History Directory," with list of Natural History Societies, and the names and addresses of naturalists, their branches of study, and (as Mr. Bernard Hobson in another part of last month's number proposes) those willing to assist. This might be given in an extra Christmas number of SCIENCE-GOSSIP, and should meet with support, unless you thought it advisable to make the Christmas number always a double one, price 8d.—*J. Morton, President, Rochester Naturalists' Society.*

DURATION OF PLANT-LIFE.—The classification of plants as annuals, biennials, and perennials, is convenient for nurserymen and practical gardeners, but many observations have yet to be made before the value of such characters can be ascertained with so much precision as to be fairly considered scientific. Canterbury bells are called biennials, but often do not flower till their third year. Then they die after flowering, and that they are plants with strictly limited lives appears in general unquestionable; at least I thought so till the present year. Now, however, I have several plants in flower, raised from seed

sown last year, and two of them have produced offsets from the base of their stems, each forming a tuft of leaves which is unquestionably such a growth as may be expected to develop into a second flower stem next year. So then I have raised from the seed of the same plant (it may be from those of the same capsule), some plants that have not yet flowered, but will probably do so in the third year, some that are flowering in the second year, and will probably die after the fashion of biennials, and some also in flower and only differing from the last in that each plant has a lateral offset from the base of the stem, which promise a second flowering next year, after the fashion of perennial herbaceous plants. Thus we see how difficult it is to speak with anything like precision of plants as having limited lives, that character being apparently as liable to variation as any other of those which have been deemed specific. I know that the pimpernel survives the winter sometimes, though everybody calls it annual.—*John Gibbs.*

"THE HEREFORDSHIRE POMONA."—We have received Part II. of this magnificent work, edited by Robert Hogg, LL.D., and which is published by D. Bogue, 3 St. Martin's Place, Trafalgar Square, on behalf of the Woolhope Naturalists' Field Club. The numerous chromolithographic plates of the chief kinds of apples and pears are works of the very highest art. Indeed, we may say, we have seen nothing at all approaching them in this respect; and, highly as we felt ourselves obliged to speak of the first part of the "Pomona," this second part is superior in every respect, literary as well as artistic. We have a capitally written chapter on "Modern Apple Lore," by Dr. Bull; "The Life of Lord Scudamore" (with an admirable portrait), who was famous for his experiments in apple grafting, and his success in introducing various kinds of apples, also written by Dr. Bull; a paper on "The Cordon System of Growing Pears at Holme Lacy" (illustrated), by Sir H. Scudamore Stanhope, and detailed letter-press descriptions of the various kinds of apples and pears figured in the present part.

MUSHROOMS.—There is, I believe, a very general idea, that mushrooms are surely to be found in a wet autumn. My own experience, however—fully confirmed in this present year—is, that the main condition for their plentiful appearance is this: that the wet autumn should be preceded by a hot summer. I live in the immediate neighbourhood of downs, whence we usually gather them in, considerable, though varying, abundance; but this year, strange to say, I have not set eyes upon one of any sort or kind. Even the ordinary fungi, which are usually so plentiful,—e.g. the Fairy-ring Champignon, *Amanita muscaria*, *Agaricus melleus*, and the Coprini, &c., are this year hardly represented. It is a fair presumption that this unprecedented scarcity must arise from the remarkable wetness of the spring and

summer; but it may be well to inquire in what way it has hindered the germination of the spores, whether by washing them deeply into the soil, or otherwise.—*C. W. Bingham.*

COLOUR BLINDNESS.—Many notices have lately appeared on this subject; they have all, however, referred to a defect in the optic nerve; but is it not possible that some of the facts stated may be attributed to an apparent change in colours caused by a change in the light? Certain flowers, for instance, show the natural colour when seen by day, but will appear to be of a totally different colour by candlelight; the change cannot be attributed to any defect in the optic nerve. Does it depend on any peculiarity in the flowers, or in the different decompositions of natural and artificial light?—*T. B. W.*

VEGETABLE "COMMENSALISM."—I have often noticed the "commensalism" of plants described by Dr. Taylor a short time since in SCIENCE-GOSSIP. When I knew very few mosses, I used to be puzzled with one particular moss that I knew at sight as well as I knew *Iva annua*, but I did not know its name. It was always associated with *Nickera complanata*, a moss I knew, and I therefore labelled my different gatherings of the unnamed moss—"always associated with *N. complanata*." One day I received from a friend a moss labelled *Anomodon viticulosus*, and before I had fairly opened the packet I recognised it as the companion of *N. complanata*. I could give instances of other mosses, but if I mention a few of the flowering plants often found together, it will be better for the generality of readers. I have observed all the following to be often together in West Yorkshire and Derbyshire, and some of them are noticed by Dr. Less, F.L.S., in the report of the Botanical Locality Record Club for 1877, "to fall naturally into groups, the integers composing which agree in having an almost identical horizontal distribution, and often a very similar vertical range as well."

{ <i>Rhamnus catharticus</i> .	{ <i>Thalictrum montanum</i> .
{ <i>Ligustrum vulgare</i> .	{ <i>Cochlearia alpina</i> .
{ <i>Taxus baccata</i> .	{ <i>Asplenium viride</i> .
{ <i>Carduus heterophyllus</i> .	{ <i>Spergularia rubra</i> .
{ <i>Trollius europæus</i> .	{ <i>Ornithopus perpusillus</i> .
{ <i>Rosa carulea</i> .	{ <i>Jasione montana</i> .
{ <i>Genista tinctoria</i> .	{ <i>Thlaspi alpestre</i> .
{ <i>Malva moschata</i> .	{ <i>Alsine verna</i> .
{ <i>Pimpinella magna</i> .	{ And not far away,
{ <i>Pimpinella saxifraga</i> .	{ <i>Hutchinsia petraea</i> .
{ <i>Rubus suberectus</i> .	{ <i>Draba incana</i> .
{ <i>Crepis paludosa</i> .	{ <i>Geranium sanguineum</i> .
{ <i>Myrrhis odorata</i> .	{ <i>Rubus saxatilis</i> .
{ <i>Stellaria nemorum</i> .	{ <i>Galium sylvestre</i> .

I could give many more instances, if necessary, but I think the above will be familiar to all experienced field botanists.—*Wm. West, Bradford.*

ENGLISH PLANT NAMES.—We have received Part I. of "A Dictionary of English Plant Names," by James Britten, F.L.S., and Robert Holland, published for the English Dialect Society by Triebner and Co. With the exception of Dr. Prior, we do not know of two men who are better able to undertake

this work than the two botanists with whose names it is franked. A good deal of Dr. Prior's philological web-spinning is absent from the derivations here given, all of which are characterised rather by shrewd common sense, and an intimate knowledge of dialects and the modes of thought of the peasantry, than by philological learning. This will be a most valuable and useful work to the botanical student.

GEOLOGY.

ADVENTURES OF A GEOLOGIST.—The geologists of England, "who live at home at ease," know little of the perils under which some of their brethren of the hammer pursue their arduous studies in other countries. The following letter from a young, but already well-known and promising geologist, Mr. R. Lydekker, B.A., who is engaged as palæontologist on the geological survey of India, will give some idea of the duties which fall to the lot of Indian geologists:—*Leh, Ladakh, Aug. 2, 1879*:—"I returned yesterday from my trip to the Chinese frontier, near the Pangong Lake, after a very rough and somewhat disagreeable time. We were at an elevation of over 14,000 feet the whole time, and had to cross five passes close on 19,000. Living so long at such an elevation, is of course extremely trying; I could not sleep at night, and when I did doze off, soon woke up choking for breath. The sun in the day was terrible in its power, and has burnt the skin off my face; so that I am bleeding every minute, and have to keep it covered with butter. At night we had hard frosts when at the height of over 16,000 feet. This alternation of temperature gave me fever. We could not halt, as we should have been starved, and I had to do three twenty-five mile marches in a fever, when I could scarcely sit in the saddle, and yet, owing to the badness of the roads, was obliged to walk a great part of the way. To add to my misfortunes my cook also fell ill, and I had great difficulty in getting him along. I am, of course, a good deal knocked up after such a rough time, and very thin, but I am going to rest here for four or five days, which will, I hope, pick me up, and then I start for Simla, which I hope to reach early in October. At the end of the Pangong Lake I tried to cross over into Chinese Tibet, but was stopped by a party of Chinese soldiers, who threatened to seize my baggage, and I was obliged to make very significant signs with my revolver before they let go. The Pangong Lake is most lovely; it is about sixty miles in length—half of which is in Chinese territory, and consequently inaccessible. The water is of the clearest blue, highly impregnated with borax, which makes it unfit to drink. Imagine this, bordered by a beach of most dazzling white sand, and the whole surrounded by towering mountains of all shades of blue, red, and purple. Not a sign of life in the water—which forms

a veritable dead sea—and not a blade of grass on the hills. Most of the country we passed through was totally uninhabited, and was indeed a "howling wilderness." Here and there, where there occur more or less green "oases" of grass, we came upon encampments of Nomad Tartars, with their curious dome-shaped black felt tents. Around these grassy patches there were generally large colonies of the yellow marmot, which set up a prodigious squeaking and squealing at our approach, and soon dived down into their burrows. Occasionally we found large numbers of the blue-tailed Tibetan hare, which made a pleasant addition to our larder. On the sandy plains we here and there came across droves of wild asses, which trotted round our caravan in distant circles, snorting and braying, and making mine and the Havildar's pony very restive. The Tibetan wild ass is a handsome animal, standing about 14'2, generally of a chestnut colour, with a stripe on the back and shoulder of a darker tint. In the Chang-Cheumo (Great Plain) valley, which runs parallel with the Pangong Lake, though separated by a lofty mountain range, there occur wide grassy plains; on these plains there are numbers of the magnificent Tibetan antelope (*Pantholops Hodgsonii*), with their long straight horns, which form has given rise (in all probability) to the legend of the unicorn. The animals stand as high as a large donkey, and have a deep red coat. The two mornings I halted in the Chang-Cheumo I saw heads of twelve or thirteen within a quarter of a mile of my tent. Unfortunately there was not cover for a cockroach on the plain, and though I several times tried to get near them on hands and knees, I was unable to get within 500 yards of them, and bagging them was accordingly out of the question, especially as my "Westley Richards" is only sighted up to 200 yards, point blank. I was, therefore obliged to turn my back on these splendid animals, as well as on the Chang-Cheumo Valley, neither of which I shall probably ever see again. The animals only inhabit that part of Kashmir territory, though common enough in inaccessible Chinese Tibet. Occasionally on our route, we met parties of Tartar traders coming from Chinese Tibet, with borax. All this borax is carried on the backs of large sheep and goats. Each animal carries a long bag loaded with about 5 lbs. at each end, and tied across its back. At night, all the sheep are tied up to a long string, like cavalry horses at a picket. The advantage of this mode of transport is, that sheep and goats get their own living, in the most barren regions. My own baggage was carried on yaks (the hairy cattle of Tibet); these beasts carry large loads, and can go up to any elevation. The only difficulty with them is, that they must have grass, for they will not eat grain. This sometimes gave us considerable trouble, as we found the yaks had broken loose, and we spent several hours in sending out exploring parties in search of them, with the result that we did not get under

weigh until mid-day, and not into camp until night. On another occasion, in crossing the Chang-Cheumo river, we had a little adventure with the yaks. The river, as is usual at this time of the year, was greatly swollen by the melting snows, and running at an enormous pace. My valet-boy (Behrer) was riding one of the yaks when they were driven into the river. Very soon they got out of their depth, and began to swim, being partly carried down by the current. The boy slipped off behind, and drifted down the stream. Luckily I was on my pony, and galloping down below, I pushed into the river and caught him as he passed. My pony, however, got out of his depth too, and I slipped off, fortunately managing to pull the boy to shore. We both had a narrow escape. We subsequently managed to cross the river with some difficulty, by means of a rope, lower down."

SUN-CRACKS.—While on an excursion of the Belfast Naturalists' Field Club recently, I observed a striking illustration of how the cracks found in the new red sandstone were formed. This was in one of the Scrabo quarries near Newtownards, co. Down, where we observed some clay, no doubt formed of the débris of the sandstone, cracked by the sun, and lying beside a large slab of sandstone beautifully marked in exactly the same manner. The way in which the cracks in both were formed strongly corroborate the general supposition as to their formation.—*J. M. Ward.*

LOCALITIES FOR FOSSIL STAR-FISH.—Many years ago I had the good fortune to obtain the rare and elegant star-fish *Protaster Salteri* (Forbes), as well as a species of Palæaster, which I cannot find figured. They, with an arm of *Glyptocrinus basalis* (McCoy), were found near together on the eastern side of Bala Lake, about a mile from Llangower, the locality being easily determined by the oval patch of Bala limestone which is marked on the geological map; the exact spot is shown by the arrow marking the dip at 30°. Mr. Salter found his specimen of *P. Salteri* at Pen-y-Gaer, near Cerrig-y-Druidion, eight miles north of Bala; I believe one surface only was obtained having two rays perfect. I was more fortunate, inasmuch as in mine both surfaces are quite perfect; it is somewhat smaller than the figure in Memoirs of the Geological Survey—Geology of North Wales, plate 23. Have any other examples of this beautiful little fossil been procured?—*Charles Ricketts.*

NOTES AND QUERIES.

INTELLIGENCE IN MAN AND ANIMALS.—In the interesting notes in your journal for September on the above subject, I am glad to see that two of your correspondents have suggested distinct definitions of "instinct" and "reason." For until the exact subject of discussion is defined, the discussion itself must be more or less confused and cross-purposed. Both Dr. Keegan and C. B. agree in the main idea of their respective definitions; and no doubt most would accept the same distinction, viz. that in *instinct* there is

unconscious adaptation of means to ends, *one* direct inference through association of ideas; whilst in *reason* there is conscious and voluntary adaptation, and often a *chain* of inference in logical connection and order. But still, supposing some such definition to be accepted generally, it appears to me doubtful whether the main question is settled thereby. A clear field is gained; but discussion, it seems to me, is still possible. For instance, on one point in Dr. Keegan's note. He says about animals, "their method of working without a trace of hesitation, &c. . . . the identity of motive in almost every case, all unequivocally suggest the idea of an automaton mechanically operating." Now, if the former part of this sentence be admitted as certain, then, of course, the conclusion is correct and strong. But what if the premises here assumed be open to challenge or doubt? Is not the argument here robbed of its whole force? And I certainly think that two of these assumptions are precarious at least:—the "working without a trace of hesitation" and the "identity of motive." Take the case of the dog, an animal admittedly the most "reasonable" or gifted with the highest instinct. Who has not over and over again observed hesitation in his conduct, especially in circumstances where a choice of actions had to be made. To all appearance the animal was considering balancing the two sides of the question, and at last—perhaps after some little time—*choosing* his course. Did he not then voluntarily decide on one of two purposes? or on one of two means to accomplish a purpose? There was first hesitation, then choice: two things, not generally attributed to any except "reasonable" beings. Again as to "identity of motive." No doubt in most cases a dog, like other animals (like his master, too often), is actuated by purely *selfish* motives. But are there not reliable instances recorded where a dog has shown clear *self-denial* and even *self-sacrifice*, qualities, by the way, hardly instinctive? Here are two contrary motives, selfish and unselfish: the "identity" is destroyed. Indeed I notice Dr. Keegan writes "identity . . . in almost every case," which, though it evades objections, weakens his case. To give his conclusion any practical value and force the identity should be *in every case*. To revert to the definitions for a moment. I cannot subscribe all at once to C. B.'s conclusion that animals are unable to follow out a train of inferences. On the other hand, some actions of dogs seem to me very difficult to account for without supposing some such train to have actually passed (dare I say?) through their *mind*. The whole subject is most difficult, but most interesting. I am afraid it will never be absolutely settled until we know much more than we do about the world of mind and spirit.—*Y. M.*

INTELLIGENCE IN MAN AND ANIMALS.—Amongst the many theories given by some of your correspondents to account for the remarkable illustrations of intelligence exhibited by many dumb creatures, I fail to see one which will cover the entire ground. It must not be forgotten that there is no medium between matter and spirit. If the brain can secrete thought, as the liver secretes bile, then there is an end of all argument concerning the soul. But if not, we must allow that brutes have souls just as humans. The question of the soul's existence after death must be left to the theologian.* For myself, I do not, acknowledge anything like instinct. "The hereditary transmission of acquired aptitudes" is a scientific fact. The knowledge an animal possesses when born is added to considerably as it grows older. If the knowledge instinctive is all an animal has, how must we explain its education? If an animal cannot

think, how must we explain all the voluntary actions which are so adapted to the occasion, and such as a man similarly situated would perform? I could enumerate some highly interesting facts concerning what I will call spontaneous intelligence; but they would occupy too much space. I will only say that if brutes were able to communicate their thoughts to one another as easily as humans, they would display still higher intelligence. If I could not converse with my fellow-man, I should be ignorant of much that I have learnt. I believe that animals have reasoning souls like men, but their powers of exchanging thoughts are inferior to ours, thus accounting for their inferior intelligence; but this inferiority is one of degree and not kind.—*A. W. King, Blackburn.*

INSTINCT AND REASON.—To me it seems that any one who knows the meaning of the word “reason,” and denies to animals the thing, must be one of those men who seeing, see not, and hearing, do not understand. It is to me beyond belief that a man who has kept a pet, or has walked about with his eyes open, or has read or heard trustworthy tales of animals, if he knows the meaning of the two words, holds that animals have only “instinct,” and not “reason.”—*H.B.* From the “Rights of an Animal; a New Essay in Ethics,” by Edward Byron Nicholson, M.A.

EYE-BRIGHT (*Euphrasia officinalis*).—This plant has been very luxuriant this season in some districts. One place in the neighbourhood of Park Place, Henley-on-Thames, was completely covered in August with its pretty white flowers. On the railway banks between Pinner and Bushey, I gathered plants with stems from 10 to 14 inches, with unusually fine flowers. The centaury (*Erythraea Centaurium*), has also been very fine and plentiful. Possibly the unprecedented wet season may have been favourable to both plants. Perhaps some of your numerous readers may have noticed a similar condition of both plants in other districts.—*J. W. Odell, Pinner.*

INTELLIGENCE IN ANTS.—Whilst weeding in the garden last August, I broke open the upper galleries of a nest of small black ants, and in so doing scattered a number of eggs, which had been carried up from below, that they might be warmed by the sun, which at the time was shining brightly. As I watched the ants gathering them into the nest, I noticed a little fellow dragging one, two or three times larger than himself, up what must have seemed to him a very steep hill; at last he stuck fast, and, after a few plucky efforts, he left the egg, made a few casts round the ground to see how the “land lay,” and then returned to the egg, which he pulled up an easy ascent, of which he had been in search, and which was in quite another direction to the one in which he was going when he stuck fast.—*Thomas Winder, Sheffield.*

SAGACITY OF A PONY.—Having read with very great interest the numerous papers which have lately appeared in *SCIENCE-GOSSIP* and “Nature” upon the “Intelligence in Man and Animals,” I venture to add to the already large list on the subject, by sending the following remarks upon a remarkable pony, which some short time since might have been seen daily grazing on the Cirencester College cricket-ground. The principal of that college kindly furnished my brother (one of the professors of the college) with the previous history of this sagacious animal, known by the name of Grimm, and it is as follows: Grimm was born and bred on the estate of Mr. Mussel, of Aden, near Aberdeen, Scotland, and sold by him, in

1852, to a gentleman who required a pony to carry his wife during his walking expeditions in Perthshire, with this caution, “Never drive him, or he will break your neck,” as he had been notorious for previous bad conduct, and had previously smashed a pony-carriage. In the stable and in the field he was gentleness itself, but was found to be very headstrong and conceited (if one may attribute such a quality to a pony), and the few misfortunes that befell him during the thirty-four years of his life, his kind and indulgent owners attributed to this defect in his character. During Grimm’s walking expeditions he must have played his mistress some very odd tricks, which she truly states must have cost thought and preparation, for he apparently always made his own arrangements for the day. One hot afternoon his mistress wished to ride some four miles to meet her husband, who was returning from Edinburgh. Until they arrived at a certain hill, Grimm was in all respects a model pony, when suddenly at this point he stopped, having decided that so far he would go, and no farther. All his mistress’s endeavours to make him descend the hill were fruitless. At last, tired out with his rearing and jumping, she unadvisedly did, what he had along intended she should do, dismounted, and dragged him down the hill by the bridle, and then hoping she had won the day, she put her foot into the stirrup to spring into the saddle, but he had been waiting for that moment, and before she could accomplish her purpose, found herself flat on the road, and on looking round, saw Grimm merrily galloping home. His memory for places and people is described as extraordinary, and on one certain day, and that only, would he take his mistress in turn to each shop she was in the habit of visiting. He learnt to open any kind of door, and would turn handles and keys, also lift latches, so that unless care was taken to lock him into his stable from the outside, he was certain to walk out again when the coast was clear. Having a large stable-yard in which he walked about in perfect freedom, his amusement was to open the door of the scullery, and steal the greens the cook was washing for dinner. She being quite deaf, was unconscious of his presence until she felt his warm nose on her shoulder, and saw her cabbage whisked off. He hated solitude, and was always happy when the dogs and their puppies were occupying the stall next to him. Grimm never accidentally injured the smallest puppy. The cat kept her kittens in his manger, and the proceedings of the family gave him much interest. This affectionate disposition was further exemplified in several ways. He expected his mistress to come and see him often, and once when she had been prevented by illness, and had not seen him for a fortnight, he determined upon reversing the order of things, and went to see her, walking through the hall to the drawing-room door, which he opened as usual; and great was her astonishment to see him triumphantly nodding his head, as if relieved to find she had not entirely disappeared. In 1862 Grimm met with a serious accident, one of his fore-legs was injured, and he ever afterwards lifted it up for inspection when his mistress appeared, and thus learnt to shake hands. On his recovery a pony was bought to drive with him, and he was placed in double harness. He was devoted to his companion, and gnawed a hole at once in the partition between the stalls to improve the means of communication. Various other anecdotes might be told of this remarkable and intelligent pony, but he soon became unfit after this period for work, and was received into the pastures of the Agricultural College, Cirencester, where he obtained a home and every comfort until death terminated his eventful career.—*E. Edwards.*

THE ROBIN.—In the months of November and December last year, I, after great perseverance and coaxing, made friends with a robin in my garden. My first introduction to my little redbreast was when forking up some ground, he perched on a tree and darted down for worms. After a few days he would stop on the ground and wait for them, and allow me to throw them to him. I then began to try him with bread and biscuit, to take it from my hand, but to no purpose; he would allow me to come very near him, but would fly away when I held out my hand with food. I still coaxed him day after day with different kinds of things, worms, &c., and at last succeeded with some tempting pieces of cheese, in the following manner, first by calling him from the shrubbery, where he was generally to be found, and as his favourite place was perching on a low boarded fence, I used to hold out my hand with the cheese for his inspection, then place my hand on the fence near him, and it was very amusing to see the shy way in which he would hop a little nearer and nearer, and peck up a piece and fly off into the trees, then return to my hand again until satisfied. After about a week of this the little fellow had confidence in me, and would come when called and perch on my hand and feed. After a while he would also come to my father, and we both took great interest in him and fed him during the winter. In the spring, when nesting-time came, we saw no more of him. However, at the beginning of this month (September), I was talking to the gardener, who was digging potatoes, when I heard a robin singing in one of the apple-trees, and I began telling him the story about the robin that used to feed from my hand, and I said to him, I wonder if this is my little friend; I will try him. I happened to have some biscuit in my pocket. I crumbled some in my hand, and gave my usual call to him, and much to our astonishment, he flew from the tree and took the biscuit three or four times in succession, then flew off into the trees, and I saw no more of him that day. I at once came to the conclusion it must be the same bird, who had not forgotten my past kindness to him. This is a wonderful instance of memory in birds.—*S. Griffin, Salisbury.*

BOOKS ON ENTOMOLOGY, &c.—Having read the "Aid to the Choice of Books on Botany," I think it very instructive and useful to those who wish to study it. Such articles as those save the young student a great deal of trouble and disappointment through not knowing which are the best books. I should esteem it a great favour if you or some of the readers of SCIENCE-GOSSIP would write an article similar to the one on the choice of books on botany, by Bernard Hobson, only to aid in the choice of books on entomology, geology, &c. I think it would be very acceptable to many young entomologists and others.—*F. J. Francis.*

CURIOUS SITES FOR BIRDS' NESTS.—Your correspondent F. F., referring to my note on curious sites for birds' nests, may throw aside any doubts he may have with regard to the original architect of the nest alluded to by me, as the magpie is the only bird that builds that class of nest with a dome, and it is so strongly built, that it will bear the blasts of five or six winters in sheltered situations, and is then not considered too dilapidated for the kestrel, that in my experience never does build its own nest, and when it lays in a hole in a tree or cleft of a broken limb, makes about the same nest as an owl, nothing more than a quantity of pellets of fur and feathers, that it had thrown up while at roost or possibly sitting. Our Selborne district used to be much troubled by magpies a few years back, but the damage done by

them to pheasant and hen-coops, induced a war of extermination, and where I have counted fifty at a time, it is now rare to see a pair; they are easily started from the nest, by a sharp blow to the trunk of the tree. Jays and magpies, though generally very wary and shy, are very bold in defence of their young when just fliers, are easily killed by imitating the cry of a young one in trouble, which can be done by a split stick and leaf, or a blade of grass between the thumbs, and if a young one be caught alive or winged, you are almost sure of the old birds.—*G. T.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general grounds as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

F. H. HADEN.—The so-called "Vegetable growth" is not a fungus, but the stalked eggs of the lace-wing fly (*Chrysopa vulgaris*).

JOHN SLATER.—The insects attacking the ears of corn are a species of Aphis, or "plant-louse," and they have undoubtedly appeared on the ears by reason of the continued wet weather. It is not a "new pest."

S. BRENNAN.—We are sorry to say the box full of fungi reached us in such an utterly smashed up condition, that there remained nothing but pulpy fragments, which were quite undeterminable. The smaller box contained, not a lichen, but a well-known alga, which often appears on gravel walks at this time of the year, *Nostoc commune*.

D. N.—The fragment of slate from the quarries at Llanberis was impressed with the black dendritic crystallisation of oxide of manganese. It is not a fossil.

W. MARTIN.—Any ordinary microscope would enable you to examine the structure of the leaves and fruits of mosses. You can purchase a capital instrument at any good maker's for about five guineas.

H. MILLER (Accrington).—A capital book for the purpose you require is Nicholson's "Manual of Palaeontology" (publisher, Blackwood). For characteristic tertiary fossils, we recommend the Charts published by Tennant, Strand, London, at 7s. 6d.

J. J. MORGAN.—It is difficult to pronounce on a plant from so small a portion as that sent, but we have no doubt that it is a variety of the orpine (*Sedum Teuophium*).

W. BENNER.—We should think you might be able to procure any of the small species of living quadrupeds from London dealers, or inquire in our "Exchange" column, stating what species you want.

A. D. MELVIN.—Will this gentleman (who mooted the idea of a Register of Field Botanists) kindly send us his full address?

DR. MORTON.—There is a Postal Microscopical Society already in existence. The idea was started in the pages of SCIENCE-GOSSIP in 1872 and 1873, which please see for rules, membership, &c. We understand this society is working in an excellent manner.

HERBERT BISHOP.—We are always willing to help students, but not to do for them what we know is best they should do for themselves. For instance, in naming fossils, as you live in London, it would be much better for you to take them to such a museum as that of the School of Mines, Jermyn Street, and name them yourself from the specimens there exhibited. Such a plan would impress the names of the fossils much better upon your memory than if they were named for you.

J. S. LLSLEY.—Many thanks for your offer; we should much like a little of the Sargasso-weed with the zoophytes on it.

T. G. HARRIS.—Taylor's "Half Hours at the Seaside," and Wood's "Common Objects of the Seashore," will enable you to name nearly all the objects you are likely to pick up. Many thanks for your kind offers. You could not get a more suitable book on microscopic fungi than that by Dr. Cooke, nor indeed a better work on the larger British fungi than the cheap popular one by the same author (both published by D. Bogue). Smith's "Ferns, British and Foreign" is the best and cheapest on that subject; and for sea-weeds, get Grattan's book, published at the Bazaar office, or Dr. Landsborough's, both are cheap.

EXCHANGES.

WILL exchange Murby's photophysical wall map of the world, for Sachs' Botany, or Jukes and Geikie's Geology, and a few good fossils.—T. Tate, Thornbury, Bradford, Yorkshire.

ANCULA CRISTATA, or well-mounted palate for *Cylichna cylindrica* or *Scalaria communis* (animal and shell).—J. Turner, Davenport, Stockport.

FOSSILS in exchange for minerals.—Rev. H. B. Capel, Great Eastern Rectory, Dunmow.

BIRD eggs and lepidoptera, in exchange for other not in collection. Many common butterflies wanted, also foreign ones.—J. A. Wheldon, South Parade, Northallerton.

I HAVE several duplicates of six spot Burnet moth (*Anthrocera filipendule*), which I shall be glad to exchange for other entomological specimens.—F. Carter, 1 Tollington Place, Tollington Park, London, N.

BRITISH shells. List of desiderata on application.—Henry Coates, Bridgend House, Perth.

FINE mounted scales or insect of *Podura curvicolis*, in exchange for other slides.—T. Forty, Buckingham.

STUDENT'S compound monocular microscope in case, with polariscope and condenser on stand. What offers?—J. Liddy, 6 Harrison Street, Kingsland.

SAND from estuary of Thames or from alluvial deposit in Isle of Sheppey, containing foraminifera, entomotrachea, and *Triceratium furvus*, and several discoidal species of diatoms in exchange for well-mounted slides.—W. H. Shrubsole, F.G.S., Sheerness-on-Sea.

NEATLY finished slide of spider (*E. diadema*) mounted whole, offered for good slide of selected diatoms or geological sections.—J. Neville, Wellington Road, Handsworth, Birmingham.

ALGÆ, zoophytes, and sponges, from the Fifth of Forth, in exchange for other algæ, zoophytes, and sponges, principally zoophytes named and localised.—Andrew Edmondsbone, 6 Huntly Street, Edinburgh.

I HAVE for exchange sets of forty specimens, seventeen species of greensand fossils, including amongst others, teeth, vertebra, and shells. Wanted specimens from other formations.—J. Arthur Floyd, Alcester, Warwickshire.

A FEW specimens of 55, 367, 394, 539, 1040, offered in exchange for plants peculiar to the south of England. Address, S. E. L., 2 King Street, Penrith.

EXCHANGE *Spartina stricta* for any of the following grasses: 1521, 1529, 1545, 1554, 1581, 1596, 1597.—Rev. F. H. Arnold, Fishbourne, Chichester.

A GREAT variety of most interesting unmounted material mostly marine, list free; also some really grand slides of marine algæ, with diatoms in situ, &c. Marine algæ in variety, well-mounted and named on suitable paper. Ditto, on glass for lantern slides, really splendid. Wanted, first class micro, or lantern slides, photo apparatus, stereoscope, &c., part cash if desired.—J. McGann, Burdon, Co. Clare.

WANTED, *Helix obsoleta*, *H. sericea*, *H. granulata*, *Clausilia biplicata*, &c.; or other British shells offered in exchange. Apply to J. W. Cundall, Carrville, Alexandra Park, Redland, Bristol.

WANTED, a specimen or two of the British *Comatula rosea* in its young stalked stage, a liberal exchange in micro slides or cash.—F. Walker, Heywood, Tenby.

ONE and a half inch micro objective, micro slides, old English coins, many in mint state, and proof engravings after Landseer, Reynolds, and Lawrence, for the following desiderata:—Allman's "Fresh-water Polyzoa," Hooker's "Student's Flora," Dabington's "Manual of British Botany," proof engravings after Turner, or slate and plate glass aquarium.—W. T. Jones, 15 Fairbank Street, City Road, London.

ENTOMOTRACHA, *Temora Finmarctica*, mounted in balsam, for any good slide; crustacea or echinodermata preferred.—E. Lovett, Holly Mount, Croydon.

FOR hair of *Ornithorhynchus paradoxus* (unmounted), send other object of interest to Mrs. Skilton, London Road, Brentford, Middlesex.

WELL-finished slides offered of *Chroolepus aureus*, *Lyngbya muralis*, ascospores of *Peziza*, ascospores of *Ascombulus*, *Acidium tussilaginis*, &c., for slides of polycistina, named diatoms, insects, or animal tissues.—William West, 15 Horton Place, Bradford.

WANTED, parasites and diatoms, named and mounted in balsam, in exchange for other mounted objects; send list to W. H. Symons, 2 Queen's Terrace, St. John's Wood, N.W.

WANTED, "HOGG on the Microscope," and Tait's "Land and Fresh-water Shells," first-class insect slides in exchange. Address, H. Inley, 150 Great King Street, Birmingham.

WILL any lady or gentleman abroad (any country) gather me specimens of sea-weeds, zoophytes, and mosses? They need not be mounted. British specimens of above offered in exchange, also beautiful bouquets of natural flowers and flowers mounted on cardboard. Butterflies also wanted from abroad. Send per sample post, stating what exchange is required, to B. B. Scott, 24 Seldon Road, Kensington, Liverpool, England.

WANTED, living specimens of rare British plants (especially critical species and varieties), in exchange for other rare (living) British plants. Lists exchanged.—A. B., 107 High Street, Croydon, Surrey.

WANTED, standard work on Entomology, or microscopic

marine objects (unmounted); offered French $\frac{1}{4}$ inch triplet objective; sketches of British insects by Houghton (quite new). L. Clarke's microscopic objects, slides, &c.—R. Brauer, Cresswell Grove, Albert Park, Didsbury, Manchester.

FINE collection of chalk fossils and micro-slides in exchange for minerals, especially fine crystals of fluor spar, calc spar, quartz, galena, &c.—A. Butt, Vine Cottage, Perry Vale, Forest Hill, S.E.

WANTED, skeletons of birds, reptiles, and small mammals, lepidoptera, and casts of fishes. Exchange micro objects, &c.—J. P. Wright, 27 Sunnyside Terrace, Undercliffe Lane, Bradford, Yorkshire.

FOR exchange, a few specimens of *Chryzomela distinguenda*, for other rare beetles; also British plants. Lists exchanged.—G. Robson, 92 Cranbourne Street, Leicester.

MACROCVCLIS CONCAVA, *Zonites ligernus*, *Helix exoleta*, *elevata*, *thyroides*, *alternata*, *appressa*, *tridentata*, *striatella*, &c., *Sphærium stamineum*, *Unio crassidens*, *Pleurocera canaliculatum* and many other American land and fresh-water shells, offered for *Testacella Halotidea*, *Succinea oblonga*, *Helix lamellata*, *revelata*, *obovata*, *Vertigo pusilla*, *angustior*, *Acme lineata*, or foreign land and fresh-water shells.—Edward Collier, 7 Dale Street, Manchester.

KESTREL, sparrow-hawk, golden crested wren, magpie, pheasant, red grouse, golden plover, common snipe, landrail, coot, wild duck, guillemot, black-headed gull, and others, desiderata, British birds' eggs.—A. Smith, 8 South Mount Street, Aberdeen.

"LONDON CATALOGUE," 7th edition, offered 79, 135, 140, 174, 177, 245, 260, 293, 316, 369, 528, 567, 613, 627, 683, 692, 841b, 853, 913, 923, 934, 1057, 1072, 1141, 1142, 1565, 1641, 1665b, *Mentha crispata* (L.), *Sisymbrium pannonicum* (Jacq.), and *Xanthium spinosum* and others, in exchange for 5, 7, 9, 10, 296, 758, 820, 1127, 1129, 1201, and others.—A. E. Lomax, Heath Terrace, Woodchurch Road, Birkenhead.

BERKELEY'S "Cryptogamic Botany," Quekett's "Histology," Roscoe's "Spectrum Analysis," Herschell's "Astronomy," Knapp's "Journal of a Naturalist," Gosse's "Devonshire Coast," and "Tenby," and the following Ray Society's publications, viz.:—Burmeister's "Organisation of Trilobites," Forbes' "Naked-eyed Medusæ," Oken's "Elements of Physio-Philosophy," "Reports and Papers on Botany," and "Zoology," Meyen's "Botanical Geography," "Correspondence of Jno. Ray." For some of the foregoing, I want Allman's "Fresh-water Polyzoa," Pritchard's "Infusoria," Bowerbank's "Spongiadea." Standard botanical works and some of Ruskin's.—B. G. Whiteman, 47 Belvedere Road, London, S.E.

P. HIPPOCAMPUS, pure, dry, and balsam slides. Also other pure gatherings. Wanted a good sample of the Yarra deposit.—W. M. Paterson, Loftus.

DUPLICATES of the following good British land and fresh-water shells offered in exchange for other desiderata—*L. Burnetti*, same variety as *lacustris* (Loch Skene specimens taken this season), *L. involuta*, *S. oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, desiderata, good foreign land shells or British birds' eggs, numerous sorts wanted.—W. Sutton, Upper Claremont, Newcastle-upon-Tyne.

WANTED, tropical beetles or butterflies, in exchange for a barn owl in glass case, or very fine cocoons of the American moth *Cecropia*.—Joseph Bates, High Street, Wellingborough.

BOOKS, ETC., RECEIVED.

"Reports and Proceedings of the Manchester Field Naturalists' Society, 1878."

"Report of the Entomologist." C. V. Riley.

"Proceedings of the Liverpool Naturalists' Field Club, 1878-9."

"Report of the North Staffordshire Naturalists' Field Club, 1878."

"Proceedings of Geologists' Association."

"Bulletin of the United States Geological Survey," vol. v.

"Feuille des Jeunes Naturalistes."

"Les Mondes."

"Scottish Naturalist."

"Midland Naturalist."

"Popular Science Review."

"Canadian Entomologist."

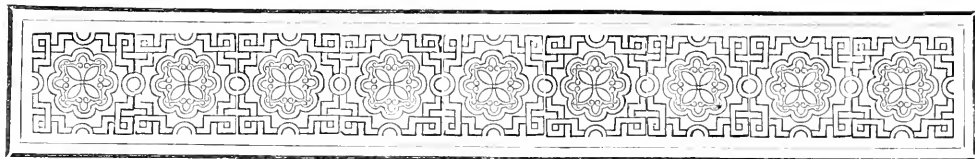
"Science News" (New York).

&c.

&c.

&c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—
E. E.—T. W. M.—A. J. B.—T. J. B.—T. G. H.—D. D.—
T. R. E.—C. F. G.—J. L. R.—F. O.—J. A. W.—W. H. S.—
J. J. M.—T. W.—T. H. H.—R. S.—F. J. F.—J. F.—G. M. D.—
H. M.—H. B.—A. H. B.—Dr. M.—G. T.—H. C.—J. W. O.—
J. P. T.—H. B. C.—S. G. F.—C. A. W. K.—J. A. Jun.—
Dr. C. R.—F. H. L.—J. D. M.—J. M. C.—C. H. D.—J. T.—
H. M.—F. H. A.—T. S.—C. W. S.—D. N.—S. A. B.—W. T. J.—
M. F.—F. W.—A. E. L.—J. W. C.—J. A. F.—A. E.—W. S.—
H. I.—B. E.—S. T.—B. W.—W. L.—W. H. S.—M. S.—
E. L.—J. F.—W. W.—H. S.—A. E.—A. B.—R. B.—E. C.—
J. H.—J. P. W.—G. R.—J. N.—W. A. L.—E. G. W.—C. W. B.—
A. S.—S. E. L.—W. M.—T. H. P.—T. McG.—B. H.—
H. E. F.—&c.



THE GEOLOGY OF THE LINCOLNSHIRE MARSHLAND.

By A. J. JUKES-BROWNE, B.A., F.G.S., ETC.

[Continued from p. 245.]



LET my readers imagine all I mentioned in my last article as taking place on the Lincolnshire coast before the marshland was formed, and when the edge of the chalk wolds was presented to the sea as a bold line of cliffs, from which quantities of chalk rubbish fell on the ice-foot below: outside they must imagine a sea full of icebergs and ice-floes borne southwards

from more northerly shores, and when driven by storms upon the coast adding their foreign freights of mud and stones to the local material out of which the gravels and boulder clays were being made. By picturing this state of things, they will understand how these peculiar deposits came into existence, why they are laid down so unevenly and irregularly, why their surface presents so many mounds and hummocks, why they are so full of pieces of chalk, and how the large blocks and boulders of other rocks came to be mixed up together in the same formation.

These glacial conditions lasted for a long time, but gradually the winters became less severe and the summers longer, if not warmer, the ice melted away and left its last burden of mud and stones to form the surface of the rolling hummocky ground which now rose gradually from the waves and stretched far eastward beyond its present limits over the ground now occupied by the marshes and far out into the German Ocean. But change, ceaseless change and movement, is ever Nature's order of the day, and

before long a reverse movement of depression set in which enabled the sea-waves to attack this rolling plain of boulder clay, and eventually to destroy the greater part of it, gradually eating back its edge, till only a narrow strip remained which now separates the wold from the marshes.

Without stopping to inquire what prevented its entire destruction, we content ourselves with observing that some change occurred, possibly in the set of the currents along the shore, which checked the process of erosion and prevented the rapid removal of the material gained from the land. The result of this change would be to cause the formation of sandbanks, and the silting up of the bays and inlets along the coast line, and thus were formed the silts and clays, which lie at the bottom of the marsh deposits (or Post-glacial beds) shown in the section of the well at Mablethorpe.

The reason of the greater thickness of the glacial clays at Anderby can now be understood; this place is in close proximity to a promontory of boulder clay, which for some reason did not suffer so much erosion as other portions of the formation to the northward. This district must therefore have continued to remain above water, while the lower beds of the post-glacial series were deposited at Mablethorpe; and some parts of it were never altogether submerged, but even now form low mounds rising above the level of the surrounding marsh.

The submergence above spoken of did not continue without cessation, but there were probably pauses during which the land was stationary for some time, and when the silted up shore gradually passed into the condition of a salt marsh just as such marshes are being formed at the present time along the shores of the Wash. The vegetation which would flourish and decay in such places, furnished the black peaty matter occurring in the upper part of these marsh clays; while the beds of turf or peat, with trunks of trees which are found in many places, prove that large forests grew and decayed on the higher parts of this marshy land; but the overlying beds of clay and silt

(often containing sea-shells) show that from time to time the forests were inundated and destroyed by the waters of the sea, and were buried beneath the muddy deposits which resulted from the inundation.

Even in historical times, the sea has often broken through the sandhills and has flooded large tracts of the marsh behind them, and the result of such inundations has always been to raise the surface of the land, by warping it up with the silt deposited from the muddy waters as they gradually evaporated.

The stiff brown clay which immediately underlies the soil near Mablethorpe, and in most other parts of the Wash, is probably the latest *warp* or sediment deposited in this manner, and some of it has doubtless been formed since the earliest banks and drains were made.

Thus was gradually built up the thick mass of clays, generally between thirty and fifty feet thick, which lies below the Lincolnshire marshland. Many centuries must have been occupied in its formation; but the climate does not seem to have differed much from that which we now enjoy, the shells are of the same species as those which now live on the Mablethorpe shore, and the trees are chiefly oak, birch and willow, like those which now exist on clay soils. It is possible, however, that the greater height of the land and the wider extent of forest growth, caused the rainfall to be greater than it is at the present time. Modern geology admits no great cataclysms or convulsions of nature, except where volcanic action has come into play, and of that there is no trace in Lincolnshire; All the changes above described have been produced by a gradual change of climate, accompanied by slow and comparatively slight movements of the land, and by the constant operation of waves, tides and currents.

The only other physical feature which remains to be accounted for is the long line of sand-hills which form a border to the marshes and protect them from the inroads of the sea. The mode in which these and similar *dunes* have been slowly built up to their present height, has often been described—the growth of grass and reeds along the margin of the shore, the arrest of the drifting sand and its accumulation round the patches of vegetation, shifting, yet ever rising higher and becoming firmer with the matted growth of reeds and other plants, till by degrees a barrier of steep sand-hills is raised by the action of wind and waves.

It is possible that the origin of these dates back to the time when the area first began to silt up, and that the marsh land has never been without a protecting fringe of sand dunes. It is certain that they have shifted their positions from time to time according as storms and changing currents have caused the loss or gain of land at different points; of one such alteration we have evidence in the low ridge called Croft Bank, along which the Roman road is carried from Wainfleet to Skegness; this appears to have been a sandy

beach at one time, and was probably backed by a line of sandhills, but the shore in front gradually silted up and formed the marsh which now intervenes between Croft Bank and the present sea margin, while a new line of sand hills began to be formed along its edge.

There is one other feature of interest connected with this part of the Lincolnshire coast, and that is the ancient forest bed which is exposed for some distance along the shore at low water. Mr. T. W. Wallis has recently given some account of this, as seen at Mablethorpe on the occasion of an unusually low tide (Sept. 28, 1878);* the following may be quoted from his description:—

“At this low water the old partly-submerged forest was well exposed, as far as the eye could reach, right and left, and many miles beyond. The width of the old forest exposed was great, but a succession of points of tree stumps kept appearing, far into the sea, so as to prove we saw only a portion of the old forest. Some of these tree stumps at Mablethorpe are very large, with large root arms branching out, but the major part were small trees; they are very numerous and stand from one to three feet above the clay, they are firm and sound, generally the upper end of each stump tapers to a point, caused by the long continued friction of the sea. I selected the most handsome stump, one literally encrusted with small shell fish, it stands about twenty inches high, and has been about ten inches in diameter, though perhaps only about a quarter of its original bulk remains. I had about one half of it cut off by a cross-cut; the wood is fir, and by counting the layers of growth I make it out to have been one hundred years old.”

The origin and date of this ancient forest bed has not yet been fully investigated; it may be the termination of one of those which occur underground in the marsh behind, or it may be a more recent growth upon ground which has subsequently sunk beneath the sea. I am strongly inclined however to think that the former will prove to be the correct view of the case.

We have now reached the end of the geological record; how long the land remained in an unreclaimed state we have no means of knowing, but the early British found food and shelter among its woods and marshes, and are believed to have constructed certain banks and drains, but these are matters which come rather within the province of archaeology and we leave the antiquary and the historian to take up the pen which the geologist here lays down.

LOCALITIES FOR FOSSIL STAR-FISH.—I am glad to inform Dr. Charles Ricketts, that I also obtained a specimen of *Protaster Salteri*, near Llangower, about two years ago; both sides perfect.”—*Owen Rees*.

* In the *Louth Times* for May 3, 1873.

FROZEN-OVER FISH-PONDS.

By W. A. LLOYD.

IN the September number of *SCIENCE-GOSSIP*, pages 193, 194, there is an inquiry by a writer signing "Piscator," respecting the manner in which fish can breathe when the water they are in is thickly and completely frozen-over for prolonged periods. Water, of course, is valueless for respiratory purposes, unless it contains a sufficient quantity of atmospheric air, a large amount of which consists of the oxygen which is necessary to revivify the blood of the creatures which breathe such water, and thus, in the manner which the writer correctly describes, the carbonised blood enters the gills at one part, and in a decarbonised, or purified state, leaves them at another part. These gills are arranged, in most or many water-breathing animals, like combs, the teeth of which the water surrounds, and supposing each tooth to be a tube through which the blood or other vital fluid flows, the walls of the tooth, or tube, are made so thin, that the blood within and the water without, can touch each other freely without mixing, one purifying the other, this being done in this beautifully contrived apparatus, in a small bulk, packed, in the case of fishes, just within the gill cover in the rear and sides of the head. The blood is set in motion, or circulated round and round in the creature's body, by the pulsations of the heart, while the surrounding water is similarly caused to flow, and to circulate, by the constant opening and closing of the mouth, these two pumps (the mouth and the heart) thus continuously working in conjunction with each other, and absolutely never stopping, so long as the creature lives. And, to serve both pumps, the water in which the fish lives has the property of absorbing by contact a given amount of air from the atmosphere at given temperatures. When the temperature is high, the quantity of air which water can take up and retain is much less than when it is cold. Thus, in hot weather, we often see a fish in a glass globe or other vessel, gulping water from the very surface of the fluid, because there it is in immediate contact with the atmosphere where the aeration is greatest, and thus the instinct of the fish teaches it to pass over its gills this fluid which has thus been oxygenated, in preference to going below for it, where the water is less aerated, and therefore, in effect, less pure. But, at a colder season, the same fish, in the same water, in the same vessel, in the same spot, and under the same circumstances, in all respects except temperature, may be observed less painfully (because in a less constrained position demanding exertion all to one end) swimming about below the surface, with the double pumps at work as ceaselessly as ever. Certainly, therefore, it might be supposed that the fish would die, if, on the one hand, the water were to be so warm that it would not retain enough air in solution, no matter how fast and well the mouth-pump worked. And, on the other hand, it

might as truly be imagined that the fish would no live—no matter how favourable the temperature might be for the absorption and retention of air—if no air could get to the water by its being for a considerable time closely covered over, as for example, by ice. But, even though the water is thus fast sealed up for a long time by a thick covering of ice, its coolness, which the ice imparts, tends to cause it to retain, the more easily, such air as it does already contain in solution. And then, too, cold retards the vital energies of the fish, and causes its respiration to be slower, and the need for the air to be consequently less, so that here are two favourable conjunctions—greater supply and less demand.

But is it absolutely certain that such frozen-up lakes have no communication with open water? How, and with what streams, are these ponds or tarns fed or supplied in summer? Cannot they be traced in winter, and, if so, is it quite sure that no water runs through them, or beneath their ice, at that time? It would be not very difficult for an ingenious person to detect if any current exists beneath the surface of any ice-bound pieces of water. I could do so in the coming winter with an absolute certainty of obtaining correct results. For example, vertical holes might be bored in the ice, and in these orifices might be firmly inserted wide glass tubes, say of an inch and a half internal bore, with both ends open, one in the water below, and one in the air above. And in such tubes, supported or hung by light rods or wires, could be placed various indexes, some for showing vertical motion, others to point out horizontal currents, and some to exhibit rotary or obliquely-running streams. It would be a very cheap thing to have three, or even more, of such tubes, each having its own office. There come other considerations, too. Thus, if by reason of a slower respiration caused by a lower temperature, there be less energy, there is also a smaller consumption of food to be thought of, and less excrement to be voided, and less sully of the water thereby, accompanied by smaller demand for oxygen to consume or get rid of the results of such voiding. Added to this, the water is, because of its icy covering, much less liable to receive excrementitious substances from land animals at or near its margin, or from birds flying over it, and indeed all dirt is hindered from entering by such covering, every small prevention of impurity being thus of consequence.

Certainly, a thick coating of ice would, especially if covered with snow, also hinder the penetration of light, and the growth would thus be partly debarred of the influence of the subaquatic vegetation which so much and indeed indispensably assists the purity and decarbonisation of the water. But this would not amount to actual darkness and complete hindrance of the office of the plants. It would only be a retardation, and one, moreover, occurring when it could best be afforded.

Connected with this subject is the wonderful pro-

vision which, is made by means of which, that, while water obeys the same general law as that governing all other substances, that of increasing in bulk by heat, and decreasing by cold, yet, *at the moment of actual freezing* it swells and becomes light. And thus it is that ice swims on water. If, on the contrary, it sank, more ice would form on the top of the water of a lake, or pond, or river, and it would sink also, and then in a short time accumulated masses of superincumbent ice would be formed, so great, that no summer's sun in this country could melt them, while every creature in such waters would perish, or rather, would never exist. And our climate would be affected in a marked manner by the omission of this other only apparently small matter, namely, the inability of heat or cold to travel downwards in water as quickly as upwards. As it is, a limited coating of ice, of thickness varying according to temperature, forms on the surfaces of water, and nearly all remains below it comfortably protected, because of the feeble conduction of cold by the ice, till returning spring. And it seems almost approaching a too great presumption for a mere mortal to admire the framing of the law which permits this slow travelling downwards of heat in water, to compensate for the equally necessary high specific heat, or *great capacity for receiving and retaining heat*, which water possesses above all other known substances, liquid or solid. As it is, the slow *downward* progress of heat through water, prevents the sun of summer from killing the plants and cold-blooded animals in it.

Sea water requires a much greater cold to freeze it than fresh water does; hence (conjoined with the motion of the ocean around England and many other countries), we seldom have ice-bound marine coasts. And hence animals of salt waters, which are in many points different to those of fresh water, and more liable from their structure and sedentary habit to be injured mechanically by such ice, as well as by its cold, are not so harmed, by reason of these wise modifications of laws. And even when sea water does freeze, its ice is not salt, but fresh, and thus, by its specific gravity being much less than that of the water in which it floats, it stands comparatively higher out of that fluid than if the latter were fresh water, and thus winds undoubtedly get a greater hold on it, and its dispersion is the speedier. And if sea water froze as readily as fresh water does, so that our islands of Britain were surrounded periodically by masses of ice, their presence generally, and the increased coldness of the winds blowing over them, would materially change our climate.

How amazingly wonderful is all this interdependence of cause on cause, and law on law, no matter how small or trifling they may appear to our dull wits:—

"And if each system in gradation roll,
Alike essential to the amazing whole,
The least confusion, but in *one*, not all,
That system only, but the *whole* must fall."*

Lower Norwood.

* The above four lines I lately read in the *Times* newspaper for 1831. No author's name is given, but I should be glad to know it.

ORNITHOLOGICAL ESSAYS.

No. III.—THE SPARROWHAWK (*concluded*).

By TOM WM. DEALY.

NEXT to the kestrel (*Falco tinnunculus*) the sparrowhawk is the commonest of the birds of prey which inhabit the British Isles. Its favourite resorts are among the wooded districts of mountainous regions, or in extensive demesnes, also in various situations, where, amid the savage repose of nature, it can bring up its young in undisturbed tranquillity; yet where it is within easy access of places whence it can command a sufficient supply of sustenance. Though this hawk nestles in woods, it beats about in more open situations,



Fig. 196.—The Merlin (*Falco aesalon*).

such as along the borders of some well tended preserve. See how stealthily, watch how warily, it flies in subdued speed up the hedgerow, and down the side of yonder plantation, on the alert for its morning meal.

In Scotland, according to Macgillivray, both the merlin (*Falco aesalon*) and the kestrel are familiarly known by the name of sparrowhawk. Like all others of the Falconidæ, it has to flee before the unrelenting hand of agriculture. Some murmur at this, and would fain see birds adapt themselves to the alterations of the land's surface. And yet, how incongruous it would appear to behold the golden eagle (*Aquila chrysaetos*), in all its slow majesty of wing over our meadow lands. Much as we regret

the disappearance of the more striking of our feathered friends, we must visit their haunts; a man who goes to look for the eyrie of a golden eagle in a flat dreary saltmarsh, would be as inconsistent as he who eagerly inquires for the beautiful bearded tit among the precipitous ranges of the Grampians.

The sparrowhawk may be said to be generally distributed over the United Kingdom. In Ireland Mr. Thompson says it is "common throughout the enclosed and wooded parts." In Scotland it is no less abundant, breeding in the adjoining islands, on the rocks which encircle them. This bird annually rears its brood on the cliffs of the Isle of May (Firth of Forth), or did so as recently as 1876. According to different writers, it is found generally dispersed over the whole of the continent of Europe. In Norway, Sweden, and Denmark (vide "Old Bushman") it is commonly seen. He procured both eggs and birds of this species, as far north as Quickiock, in Lapland. According to the same writer, it is known by the name of "sparl hók" in Sweden. It also extends its range to Asia, as far east as Japan, from whence specimens of this bird are said to have been received. In Africa also has it been observed, in the countries bordering the blue Mediterranean on the north, and separated from the scorching, arid wastes of the Sahara by the Atlas mountains and their continuations. From the foregoing, it may be inferred that the sparrowhawk has a very wide and extensive area of distribution.

These birds commence to build their nests during the month of April, at which time they may be seen soaring high in the heaven over the site they have chosen. It may be that a deserted nest of some magpie (*C. pica*), or other of the Corvidæ is chosen. If necessity demands it is repaired. The nest is situate on some branch, midway up the tree, and is formed by twigs and small parts of pine and larch, often with the unopened buds still green and fresh, as though recently broken off. It has a slight hollow in the centre, lined perhaps with a few dead leaves, or there may be no lining. Sometimes it is very large and cumbersome; while, on the contrary, others are so small, and the twigs so scanty, that the blue sky may be discerned through them, leading one to suppose, that they at times take possession of the nests of wood pigeons. If the wood be extensive, there would probably be more than one pair of these birds in it. I have known three different nests to be within a distance of fifty yards. If not molested, they will frequent the same neighbourhood year after year. When it nidificates on the shore cliffs, it takes possession of the nest of some Kittiwake or other gull, and the nest will then consist of seaweeds and such like material. The vicinity of this bird's haunt is apparent, the remains of birds, scattered feathers and pellets being as a rule found in profusion, evident tokens of its unsavory meals.

The eggs are four or five in number, of a round

form, about the size of a large plum. They have a bluish-white ground, spotted here and there with reddish-brown spots; in some very faint and indistinct, but in others the markings stand out clear, and in well-defined relief. In some the spots become large blotches of a rich reddish-brown, which gives the egg an extremely fine appearance. There is also a rare variety, which has a large blotch on either end, covering it like a cap, and a still rarer variety is that with a band or zone of richly coloured blotches encircling the egg. I have one in my collection which was taken out of Lancashire, in which the ground colour cannot be perceived, the egg being clouded with a light chestnut colour. This is the nearest approach to a kestrel's egg which I have ever seen. When recently taken out of the nest, the markings of this bird's egg may be washed off when water is applied. When the nest is robbed of its eggs, it is not invariably forsaken. I myself took two eggs out of a nest, and on visiting it during the succeeding week, found three other eggs. A more remarkable occurrence of the nature, I mentioned in this periodical some time previous, when no less than five different sets were taken from one nest.

When the eggs have been hatched, both birds appear to increase in their savageness of disposition, and show their emotions by flying round when the intruder is sacking their home, uttering piercing cries, and at times will not hesitate in attacking the aggressor. It is at this period when so much nutriment is required. Both birds are actively employed during the day in reconnoitring the contiguous country to supply their voracious family. Many are the cries loudly uttered, proceeding from the depths of the nest, as either of the parent birds are despatched sailing towards its hungry progeny with a delicious morsel, the result of its forage. At this period, the time of incubation, they become extremely daring, and many are the incursions they make into forbidden territories. In their eagerness to feed their young, by their instinctive parental emotions, which are strong within them, by their impulsion to provide their family with food, they throw off for a time their habitual retirement, and bring themselves into closer intercourse with the abodes of men. Where vigilance is lax, the loss of a young duckling, or the absence of a chicken, informs the careless housewife that the "sparl hók" has paid her a visit.

The unceasing exertions made by these birds to supply their young with an adequate sufficiency of food, testifies that, despite the naturally savage tendency of their temperament, they lack not in their innate, instinctive affection for their young.

Like other predatory birds, the "pigeonhawk" has the power of ejecting, in pellets, indigestible portions of its meals.

So familiar is this bird, that a brief description will suffice. The female is between fourteen and fifteen inches in length, while the male is but twelve. The

upper parts are brown, the wings being of a deeper tint; the tail is greyish-black, crossed by darker bars. The neck and breast are almost an immaculate white, becoming a dirty yellowish-white under the belly, which is irregularly marked with dark arrow-head like marks. The cere is yellow, the bill blue, becoming black towards the point, the legs and feet of a brilliant yellow, and the long talons are black.

"FRIENDS IN COUNCIL:" A LIST OF ASSISTING NATURALISTS.

THE persons mentioned below have signified their willingness to gratuitously assist learners of natural history and others, personally when practicable, otherwise through the post. It is, however, to be distinctly understood that this list is not intended to include professional naturalists *only* or chiefly, but all lovers of nature who have any knowledge of the subject. Additional names will be gladly received by me and inserted in a supplementary list. This index will show a visitor to any of the undermentioned places to whom he may apply for assistance in studying its natural history. Any one finding a specimen, of which he desires to know the name, may forward it to one who makes such objects his speciality, &c. In using the list it is suggested that those who write for information should enclose addressed post-card or stamps for reply. Before sending specimens of any value, it will be well to ascertain whether the correspondent is willing to return them; if so, sufficient stamps to prepay return should be annexed. When sending fragile objects the address may be written on a *separate* linen label, to obviate their being crushed under the post-office stamp. As Messrs. Kelly remark in the London Post-Office Directory, "'Esquire' should be added to the name of every gentleman to which no inconsistent addition is affixed." Please acquaint the Editor with any change of address, in order that it may be notified in SCIENCE-GOSSIP.

Tipton Elms, Sheffield. BERNARD HOESON.

BEDFORDSHIRE.

Luton. J. Saunders, 47 Rothesay Road. *Botany, Geology*, particularly plants and fossils of Cretaceous strata.

CHESHIRE.

Frodsham. James F. Robinson. *Mosses, Fungi, or other plants.*

CORNWALL.

Falmouth. J. S. Ilsley, 6 Trevethen Terrace. *Botany, Geology*; local plants, marine animals, rocks and fossils exchanged for non-local rocks and fossils.

DEVONSHIRE.

Kentisbeare, Cullompton. Rev. W. Downes, F.G.S. *Geology.*

DORSETSHIRE.

Blandford. Rev. O. P. Cambridge, Bloxworth Rectory. *Arachnida.*

DURHAM.

Hartlepool. C. O. Trechmann, Ph. D. *Rocks, minerals*, especially *crystals*.

West Hartlepool. Robert Morton Middleton, jun., Fountain House. *British and North American Botany, Mammals, Birds and Reptiles.* John E. Robson, Bellerby Terrace, *Entomology*, especially Macro-Lepidoptera.

ESSEX.

Colchester. Henry Laver, F.L.S., 1 Trinity Street. Land and freshwater *Shells, Cheiroptera, Mammals*, (except *Cetacea*), *Reptiles*, all British.

KENT.

Rochester and Chatham. Dr. J. Henry Morton, Pres. Rochester Nat. Soc. *British Flora*, especially *Phanerogams, Microscopic* mounting, General *Natural History*.

Tonbridge. Miss Edith Thomson, Judde Place. *Botany, Conchology, Microscopy.*

LANCASHIRE.

Manchester. James Walkden, 183 Broad Street, Pendleton. *British Coleoptera.*

Urmston, 5 miles from Manchester. Thomas Armstrong, F.R.M.S., Highfield Bank. *Microscopy.*

NOTTINGHAMSHIRE.

Nottingham. C. J. A. Crawley, High School, *Botany*, chiefly *Phanerogams, Geology, Mineralogy.*

OXFORDSHIRE.

Oxford. G. C. Druce, F.L.S., 118 High Street. *Phanerogamic Botany.*

Witney. W. H. Warner, Standlake. *Zoology.*

SHROPSHIRE.

Parville, Wellington. Robert Anslow. *British Flowering Plants, Mosses and Hepaticae.*

Shrewsbury. William Phillips, Canonbury, Kingsland. Hymenomycetes, Discomycetes, Myxogastres (*Fungi*). Specimens to be freshly gathered, carefully packed, not to be returned.

SURREY.

London. Thomas B. Linley, 88 Blackfriars Road, S.E. *Geology.*

London. B. Daydon Jackson, F.L.S., F.R.M.S. Memb. Soc. Roy. Bot. de Belgique, 30 Stockwell Road, S.W. *Botany*, especially its early literature.

SUSSEX.

Eastbourne. Miss Annie Woodhouse, Rutland House. *Flowering plants.*

Hastings. R. Leonard Hawkins, Hillside, Cornwallis Gardens. Fresh-water *Alge*: will gratuitously mount slides, *i.e.*, one of a specimen; correspondent to furnish material.

WESTMORELAND.

Kendal. J. S. Metcalfe, 55 Highgate. *Botany, Ornithology*.

WORCESTERSHIRE.

Hales Owen, 7 miles by rail from Birmingham.

George T. Harris, Spring Villa. *Botany*.

Malvern Link. R. F. Towndrow, 2 Commercial Buildings. *Botany, Entomology*.

North Malvern. Arthur D. Melvin, Ashford Cottage. *Botany*.

YORKSHIRE.

Saltaire, 3 miles by rail from Bradford. Henry T. Soppitt, 2 Bromley Street. *Botany*.

Scarborough. George Massée, Biological Laboratory, Oak House, Oak Road. *Flowering Plants, Microscopic Fungi*.

Selby, 12½ miles by rail S. of York. W. N. Cheesman, Hon. Sec. Selby Nat. Soc., The Crescent. *Botany, Microscopy*.

Sheffield (2 miles from), George Robert Vine, 112 Hill Top, Attercliffe. Recent and fossil *Polyzoa*, Microscopic structure of *coal plants*. G. R. Vine, Jun. (same address). Recent and fossil *Foraminifera*.

Sheffield. James E. Westby, 42 Spooner Road, Broomhill, *Geology*. Bernard Hobson, Tipton Elms, *Phanerogamic Botany*; will return specimens if desired.

Thirsk, 9 miles S.S.E. Northallerton. William Foggitt, Market Place. *Phanerogamous Plants*.

WALES.

Merionethshire, Dolgelly. Owen Reese, Meyrick Square. *Geology*.

SCOTLAND.

Co. Roxburgh, Kelso. Andrew Brotherston, Shedden Park Road. *Botany*.

IRELAND.

Co. Antrim, Belfast. Thomas Workman, Bedford Street. *Spiders*.

Co. Clare. Gortaclare, Burren (nearest station Gort. Co. Galway), Terence McGann. *Botany, Microscopy*, mounts slides, supplies micro material, algae and living plants on exchange, &c.

Co. Dublin. Lucan, 6¾ miles by rail from Dublin. Joseph Edward Palmer. *Ornithology*.

SOUTHERN GERMANY.

Baden-Baden. Max Leichtlin, proprietor of *Botanic Garden*, Station for introducing new and rare plants.

A list of *Entomologists* by H. T. Stainton, F.R.S., occupies first fifty-five pages of "Entomologists' Annual" for 1860, pub. Van Voorst, 2s. 6d.

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

No. IX.

By J. E. TAYLOR, Ph.D., F.L.S., F.G.S., &c.

PERHAPS no fossils have such a geological value as corals. If the extinct species were marked by the same habits as their modern representatives (and in many cases the families of living corals are so ancient, and the extinct forms glide so imperceptibly into existing kinds that there is no absolutely strongly-marked line of division), then their value to the physical geologist who endeavours to restore the conditions of primeval seas is immense. For coral-animals can only flourish where the sea-water is clear, and therefore where no muddy sediments are forming. And coral-animals are easily separable into two groups—the single and simply compound corals, which are usually inhabitants of deep water; and the reef-building corals which cannot live and flourish beyond the depth of twenty-five fathoms. Moreover, coral reefs indicate to the physical geographer slowly subsiding areas of the sea-floor. They are also indicative of a certain degree of ocean temperature, for we do not find them where the sea-water is cooler than 62°, and therefore the sub-tropical belts of our globe now roughly comprehend their distribution. But we find fossil corals simple, compound, and reef-building. They are characteristic of many thick limestone formations, from the Silurian upwards. We have fossil reef-building corals where their modern representatives could not now live. What climatal changes do not these valuable fossils indicate! Not less important are the condition of the ancient seas they lay before us. We carry our minds back to when coral islands, fringing-reefs, and barrier-reefs were in British seas. These reefs also tell the geologist of the adjacency of land, and inform him of the fact that the sea-floor was in a state of subsidence.

Moreover, few fossils are prettier, more easily procurable, or look better in the cabinet, than corals. They are found in nearly every limestone formation which was originally deposited in the sea. No other fossils can be so well studied, cut into sections and examined under the microscope. And they are so very abundant that the limestone walls in the hilly districts where Silurian, Devonian, Carboniferous, or Oolitic limestone crops up, are often composed of little else than blocks of fossil coral.

We are beginning to understand the true relationship of living and extinct corals better than we did, thanks to the labours of Dr. Sorby and Mr. H. N. Mosely. Formerly these animals (classified chiefly by the stony or limy parts they leave behind), were all grouped among that order of the Actinozoa called "Zoantharia," of which the common sea-anemone is the type. The order "Zoantharia"

was split up into three divisions, called Tabulata, Rugosa, and Aporosa. It was thought that the two former were Palæozoic types of corals, and the third of Neozoic and Recent corals. Let us examine the fundamental difference of these three groups. The

many stories. They are compound corals, whose shapes are modified by the manner in which they grew, so that some are polygonal, or many-sided, and others oval or round. The most remarkable of these tabulate fossil corals are *Heliolites*, *Favosites*,

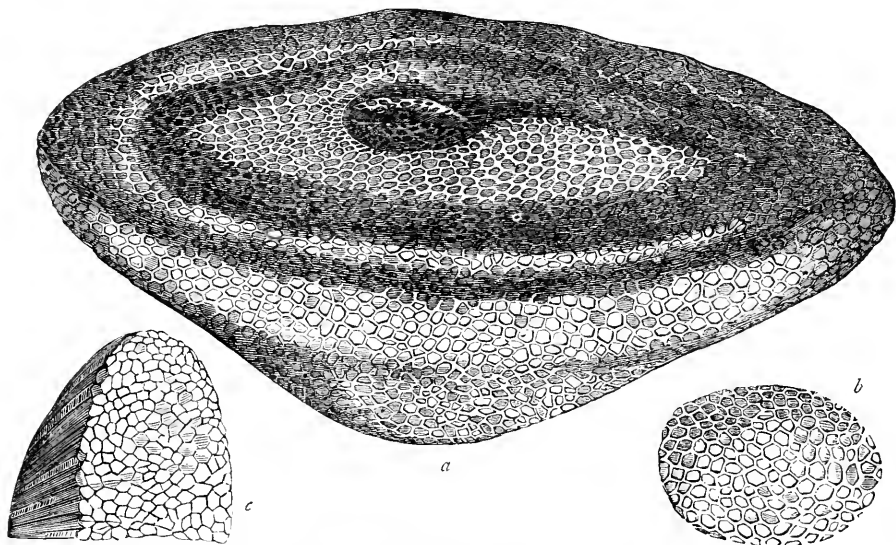


Fig. 197.—*Favosites Gothlandica*. A Silurian and Devonian Coral (complete specimen); *b*, young specimen; *c*, section showing the polygonal tubes.

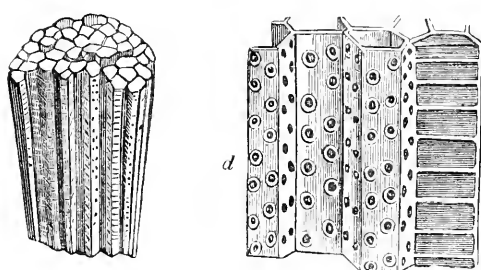


Fig. 198.—*Favosites Gothlandica*, *c*, cluster of tubes of *Favosites*; *d*, tubes (magnified), showing tabulæ and perforations connecting the tubes.

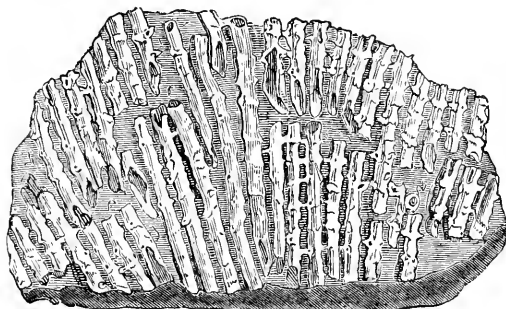


Fig. 199.—*Syringipora ramulosa*. Carboniferous limestone formation.

tabulate corals are remarkable, and indeed obtain the name which distinguishes them, for the floors which seem to horizontally split them up into so

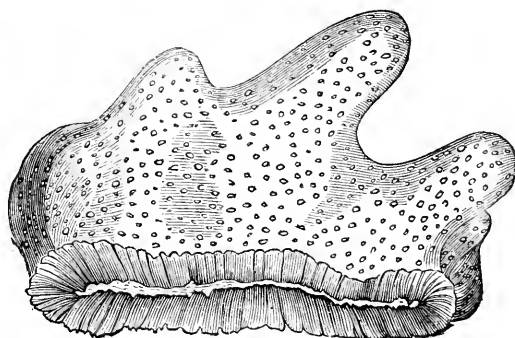


Fig. 200.—*Heliopora cerulea*. Recent Alcyonarian Coral.

the pretty "chain-coral" (*Haliysites*), *Syringipora*, &c. It will be seen from fig. 198, which shows a magnified section of a very abundant Silurian coral (*Favosites Gothlandica*), that the coral-tubes—as we may call them—are separated into horizontal chambers. The walls are perforated, as they are in some of the Alcyonaria, possibly for transverse canals. It will also be seen that the interiors of the corals are *not radiated*—that is, have not these vertical plates springing from the walls which are called *septa*, or if they are present in *tabulate* corals they are very feebly marked. This general absence of *septa* is the leading distinction of tabulate corals. Mr. Mosely thinks that most if not all of this group are in reality not Zoantharians, or *true* corals, but Alcyonarians, of which the common organ-pipe coral (*Tubipora musica*) is the best example. Some

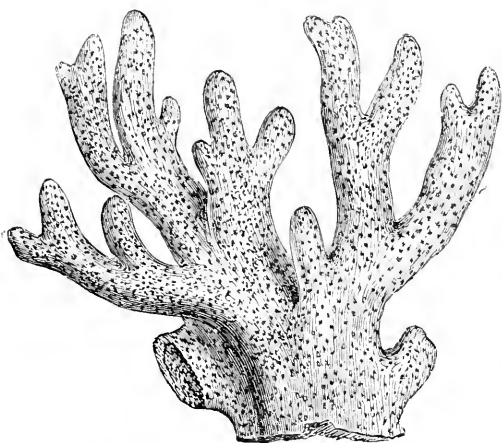


Fig. 201.—*Millepora alaicornis*. A recent Hydrozoan "Coral," Bermudas.

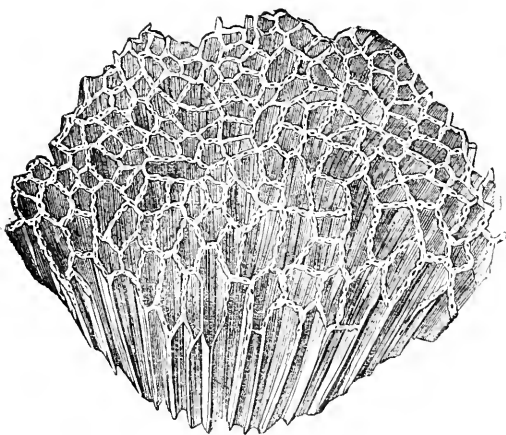


Fig. 202.—Section of "Chain-Coral" (*Halysites catenulatus*), showing tubes. Upper Silurian formation.

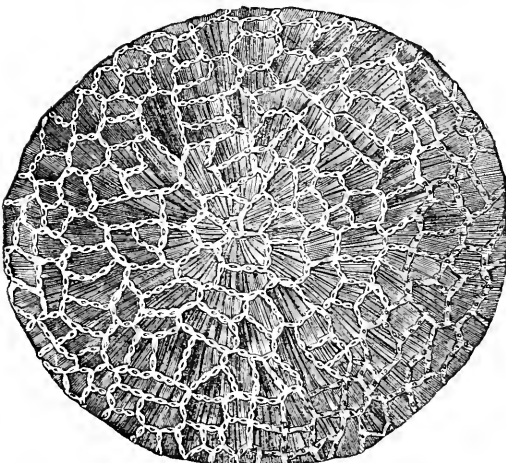


Fig. 203.—"Chain-Coral" (*Halysites catenulatus*).

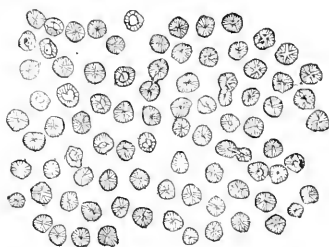


Fig. 204.—Horizontal section across block containing *Lithostrotion junceum*. Carboniferous limestone.

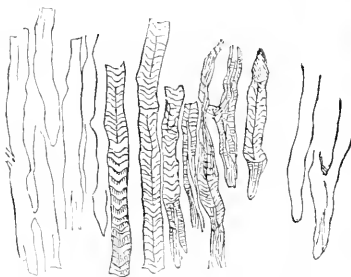


Fig. 205.—Vertical section of *Lithostrotion junceum*.

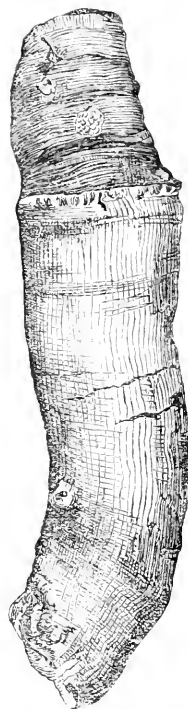


Fig. 206.—*Amplexus coralloides*. Carboniferous limestone.

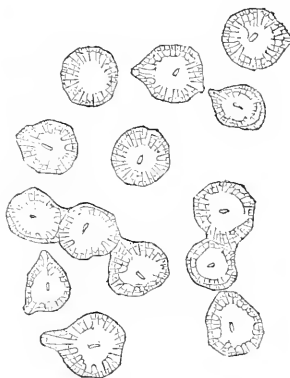


Fig. 207.—Horizontal section of *Lithostrotion Phillipsii*. Carboniferous limestone.

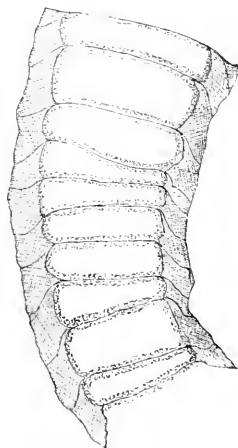


Fig. 208.—Vertical section of *Amplexus coralloides*, showing the tabulae.

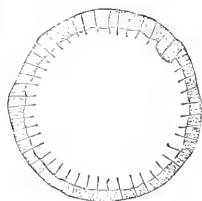


Fig. 209.—Horizontal section of *Amplexus coralloides*, showing feebly developed septa.

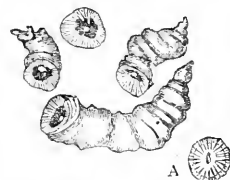


Fig. 210.—*Cyathaxinia*. Carboniferous limestone. A, Horizontal section.

of the so-called corals, as the Millepores, he has proved to be not corals at all, but that they actually belong to the Hydrozoa. He has shown that there is a peculiar division of labour in the polyps of modern Millepores, some of the zoophytes catching the food and others digesting it, after they have received it from the catchers. This is the case in *Stylaster*, where the food-catching zoophytes very much resemble the tentacles arranged round the mouth of the common sea-anemone.

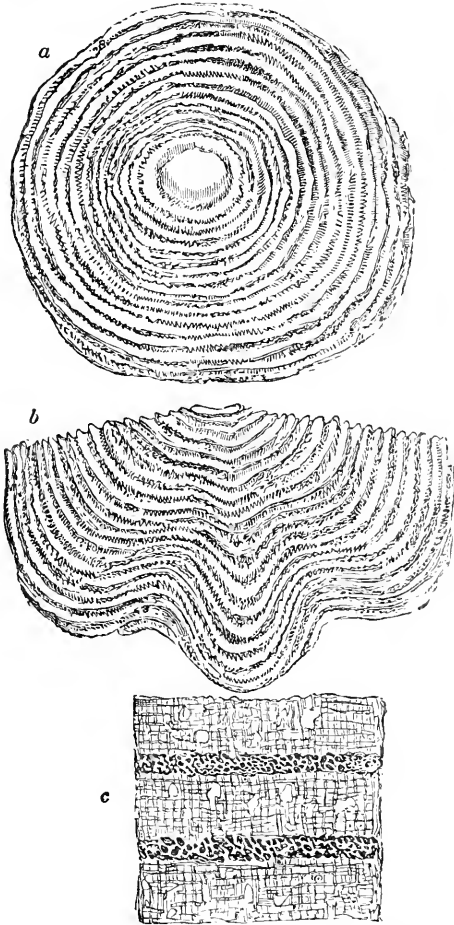


Fig. 211.—*Stromatopora concentrica* (Upper Silurian and Devonian formation), now believed to be a calcareous sponge; *a*, surface of fossil; *b*, vertical section; *c*, portion of *Stromatopora concentrica* magnified.

The abundant recent coral *Heliopora cœrulea* (whose specific name comes from the bright blue colour of the stony structure, which is usually white) is an Alcyonarian, more nearly allied to some of the sea-fans than to true corals. It is plentiful in equatorial seas, and especially off the Bermudas. It has not indistinct traces of septa. The *Heliolites* so abundant in the Silurian and Devonian limestones, do not differ in any important particular from the living *Heliopora*, and like it they no doubt belonged to the Alcyonaria.

The division called Rugosa, on the other hand, is distinguished by well-marked *septa*, radiating from the coral walls towards the centre, in the pretty star-shaped fashion which caused Cuvier to group these creatures along with other similarly star-rayed in their shapes, into the sub-kingdom Radiata, now no longer accepted by naturalists. In this radiated structure, therefore, the Rugose corals resemble the Aporose corals. But whereas the Tabulate and Rugose corals (with few exceptions) are limited to Palæozoic rocks, the Aporose corals are peculiar to those formed since then. Again, the septa, or radiating ridges, of the Rugose corals are always in multiples of four; whilst those of Aporose corals are in multiples of six. Besides this means of distinguishing the Aporose corals from any of the others, the fact that they never have tabulæ—that is, are never divided into horizontal layers—is another important distinction. When the tabulate corals have faint traces of septa, we can see they are also in multiples of four, and they thus show their structural relationship to the Rugosa. Dr. Sorby has shown that the tabulate corals are built up of Calcite, whilst the Neozoic and modern corals are formed of that limy structure known as Arragonite. It may be that the Rugosa are descended from the Tabulata, which would at once make clear why the tabulate corals appear in such numbers of species and in individuals in the Silurian and Devonian seas. In the Carboniferous rocks the most numerous corals are the Rugose kind, in which the radiated structure is very plainly visible, as in *Lithostrotion junceum*, &c., of which we give illustrations of the transverse appearance they present when cut and polished. For some of our illustrations we are indebted to Mr. James Thomson, F.G.S., of Glasgow—one of the most enthusiastic and diligent students of Palæozoic fossil corals in Europe. The numerously represented fossils called *Stromatopora* (fig. 211)—so abundant in our Silurian and Devonian limestones (in the latter, about Plymouth and Torquay so plentiful that rock-masses are composed of them alone)—are now believed to be Calcareous sponges, or sponges whose abundant limy spicules amalgamated into the concentric rings which are characteristic of their structure. The student may study this structure in any polished mantel-piece formed of Devonian marble from the quarries of Newton-Abbot and the neighbourhood. By far the prettiest of the Palæozoic fossil corals are those belonging to the Rugosa, such as *Strombodes*, *Cyathophyllum* (perhaps the most plentiful of them all), *Cyathaxinia* (a simple coral), *Lithostrotion*, *Lithodendron*, &c. Perhaps the true simple coral which may be regarded as the simplest in structure is *Amplexus*, and there is reason for believing that many more elaborate fossil corals pass through a kind of *Amplexus* stage.

We shall have to devote separate articles to generic descriptions of fossil corals, and localities where they are most abundant.

THE HISTORY OF THE APPLE-TREE.

By H. G. GLASSPOOLE (*concluded*).

THE apple belongs to the natural order of the Rosaceæ, of which the rose is the type or head of the family.

In Britain it is found in a wild state in the hedges and on the margins of woods as far north as Morayshire, and as high as the agricultural zone. Wherever it occurs in a wild state, the tree when young is generally furnished with thorns, but these disappear as it advances in age. The tree is of moderate size and spreading, the branches more horizontal than those of the pear. It is stated that the apple-trees introduced into the Sandwich Islands have entirely changed their habit of growth, and send up long vertical and almost branchless shoots.

Apple-wood is fine grained, hard, and compacted. It is used for turning and for many other purposes where hardness and variegation of colour are objects. The tree is very tenacious of life; many are known to bear fruit at the age of two hundred years. One of the most beautiful sights in the country during a fine May is to see an orchard filled with apple-trees arrayed with white and rosy blossoms, the delicate fragrance of which is "less than roses and more than violets." Mr. Ruskin, that great observer of nature's varying beauties, remarks in one of his works, "that of all the lovely things which grace the springtime of this fair temperate zone, I am not sure but the blossoming of the apple-tree is the fairest."

The fruit of the apple contains sugar, malic acid, mucilage, vegetable fibre and some aroma on which their peculiar flavour depends; the sugar is similar to that found in the grape, and differs from the sugar of commerce in not being crystallizable. Malic acid is found in strawberries and other summer fruits; it is largely used in the art of dyeing cotton goods, &c. When the fruit decays, the sugar is changed into a bitter principle and the mucilage becomes mouldy and offensive. Heat when in cooking tends to break down the interstices of the cells of the pulp, diffuses the acid and sugar more uniformly through the mass, and renders the whole more easy of digestion. The juice obtained from the wild crab is called *verjuice* and is applied externally for sprains, cramps, &c.

The derivation of the word apple is curious. In Saxon, *æppel*, *æppul*; German, *Apfel*; in Welsh, the *aval*; this word primarily signifies fruit in general, especially of a round form, as in Welsh not only apple but plum and other fruits. *Aval melynhir*, a lemon; *aval euraid*, an orange. Dr. Prior remarks that in all Celtic and Slavonic languages the word is (with the allowance of dialect) the same, and it is the only one for which we have a name that is not derived from the Latin or French. Dr. Prior tells us the meaning of the word is unknown. It is very possibly from Sanskrit *amb*, "eat," and *phul*, "fruit," but as *ap* is in

Zend and Sanskrit "water," we might be tempted to believe that it originally meant water-fruit or juice-fruit with which the Latin pronoun from *potio*, "drink," exactly tallies. (See Prior's "Names of British Plants.")

In former days the apple occupied an important place in the sports and superstitions of our forefathers, some of which survive, even to the present day, among the rural population of our villages. On St. James's Day, before the Reformation, the Catholic priests were accustomed to bless the apple-trees and commend the fruit to the saint's protection in terms of a formal prayer and benediction, still preserved in the Sarum Manual. There is also an old saying that when it rains on St. Swithin's Day it is the saint christening the apples. In Devon and Herefordshire it was the custom on Twelfth Night to salute the apple-trees in the orchards, hoping thereby to obtain a good crop next season. The ceremony consisted of taking a wassail bowl of cider with toast in it, and pouring the liquor about the roots of the trees, and hanging bits of toast on the branches of the most barren, the rustics dancing round in a circle singing:

"Health to thee, good apple-tree,
Well to bear, pockets full, hats full,
Pecks full, bushels bags full."

Another custom is apple howling, which takes place about Christmas. A troop of boys visit different orchards blowing a cow's horn, and encircling the trees, rap them with their sticks, as they repeat the following words:

"Stand fast root, bare well top,
Pray God send us a good howling crop;
Every twig, apple big,
Every bough, apples enow,
Hats full, caps full,
Good quarter sacks full."

These ceremonies are supposed to be a relic of heathenism, and were first instituted as a sacrifice to Pomona. After the performance alluded to above, the boys expected to be rewarded with halfpence from the owners of the orchards.

That this custom was practised in Sussex we learn from the Journal of the Rev. Giles Moore, who writes "26 Dec. I gave the howling boys sixpence." No doubt the boys of the parish had been performing a relic of a heathen custom in the parson's orchard. Amongst the popular customs in Nottinghamshire, if a girl had two lovers, and wished to know which would be the most constant, she procured two brown apple-pips, and having named them after her lovers, stuck one on each cheek, the first that fell off was instantly discarded as being unfaithful. It is to this custom that Gray alludes in his spell:

"See from this core two kernels now I take,
This on my cheek for Lubberkin is worn,
And Booby-Clod on t'other side is born.
But Booby-Clod soon falls upon the ground,
A certain token that his love's unsound;
While Lubberkin sticks firmly to the last,
Oh were his lips to mine but joined as fast."

See Brand's "Popular Antiquities" and Thistleton Dyer's "Customs" for further details on this subject.

In Servia when a person is suffering from consumption and the efficacy of ordinary simples has failed, the babas, or doctor, takes three apples which grew upon the same branch to represent the Trinity; a knife is driven into one of these and left there twenty-four hours, and then the apple is given to the patient to eat, after which, in desperate cases, the patient is stretched on his stomach on the ground, and the babas strews salt around him, and then strides several times over him from right to left, making mysterious signs and muttering formulas that are reputed to be sovereign remedies.

The saying "To have everything in apple pie order" is supposed to have its origin from the following circumstance. It was the custom many years ago to take off the top crust of an apple pie and mash up the fruit with sugar and cream, then cut the crust into triangular pieces like soppits and stick them end downwards into the fruit in various patterns, as circles, crowns, stars, &c. (see "Notes and Queries," 3rd s. vol. vii. p. 265).

In Scotland the apple-tree is the badge of the Clan of Lamont.

MICROSCOPY.

CLEANING OLD SLIDES.—I have seen several ways of cleaning turpentine or soft Canada balsam off slides recommended, but have never seen methylated spirit named. I have used it for some time, and like it. It is clean and pleasant; cleans fingers, knives, needles, &c., and answers well to clean slides after scraping off superfluous balsam. Thin circles, after soaking in water, can be put on glass, scraped, and finished up with spirit, being dipped in it if necessary. I recommend at least a trial of it; a very little is enough, in many cases a drop or two.—*W. Locock, Clifton.*

MICROSCOPICAL SOCIETY OF LIVERPOOL.—The eighth ordinary meeting of the eleventh session of this society was held at the Royal Institution on Friday evening, November 7; the president, the Rev. W. H. Dallinger, R.M.S., in the chair. The hon. sec., Mr. I. C. Thompson, announced the following donations, viz. Beale's "How to work with the Microscope," from the president; Pasteur's "Studies in Fermentation," from Mr. Edmunds, The Limes, Birkdale, and three slides of mineral crystals from W. H. Grattan, honorary member. Mr. Charles Botterill exhibited and explained a new form of life-slide devised by him, adapted for the examination of a wide range of objects. The advantages claimed for this slide are, the facility with which it can be used and cleaned—its reversibility, allowing either side of the object to be examined through thin glass—the provision for renewing the supply of water without disturbing any part of the apparatus, thus enabling objects to be kept under examination for an indefinite period, the same

arrangement also allowing of the introduction of colouring matters, as carmine, indigo, &c.; and lastly, its moderate cost and durability. The president, the Rev. W. H. Dallinger, made some valuable remarks, entitled "Notes on Bathybius as an entity at the base of the Organic Series," holding that Bathybius, as admitted by Huxley himself, has a very doubtful existence, and that it is not wise to bolster up an hypothesis quite capable of standing without Bathybius as an argument in its favour, seeing that the Foraminifera furnish an example of the simplest form of granuleless protoplasm, and therefore stand much lower in the scale of animal life than even the Amœbæ. The Rev. H. H. Higgins, made some interesting observations on the "Plasmodium of the Myxomycetes," illustrated by diagrams. He described some researches which he and the Rev. William Banister had made upon this fungoid condition, and from which he had, after considerable patient watching succeeded in detaching a small speck which exhibited under the microscope the true amœboid form showing curiously-shaped moving pseudopodia. The Rev. William Banister followed with further observations on the subject. The meeting concluded with the usual conversazione.

RULES, &c., OF MICROSCOPICAL SOCIETIES.—As a few microscopists in Manchester contemplate forming themselves into a Microscopical Society, perhaps some of your readers would be kind enough to send us a copy of rules of similar societies for our guidance. All information on the subject will be gratefully acknowledged.—*Richard A. Bastow, 6 Dover Street, Higher Crumpsall, near Manchester.*

THE INHABITANTS OF A DROP OF WATER.—It may interest some of your readers to learn that in a single drop of water obtained from pits in the south-west corner of Hale-moss, Bowden, Cheshire we obtained the following, Vorticella, Brachionus, *Rotifer vulgaris*, Paramecium, Cyclops, Salpina, Volvox, Stentors, Epistylia, *Trachelium ovum*, Vibrio, Spyrogyra, Closterium, Navicula, Diatoms various, and a host of small animacula scarcely visible with the one inch objective which we were using; also some larvæ and other creatures which we could not name.—*R. A. B.*

HOW TO AVOID AIR BUBBLES IN PREPARING DIATOMS IN SITU.—Thinking the following mode of preparing diatoms *in situ* perfectly exempt of air bubbles might prove interesting to some readers of SCIENCE-GOSSIP, I asked of my friend Mr. Paul Petit, of Paris, permission to send you an extract of an article which appeared under his name in the "Brebissonia" last February. The process is this:—Instead of burning at once the valves on the cover, as proposed by Mr. de Brebisson, which does not always destroy all organic matter, the gathering (of marine after several washings in fresh water) is placed in concentrated nitric acid for twelve hours;

the object of this immersion is to ensure the entire destruction of the cellulose, when the valves after repeated washing are then burnt on the cover at a dull red heat until perfectly white. The cover being allowed to get cold a drop of oil of lavender is placed on it. Mr. Petit, after many experiments with different mediums, has found that this oil is the only one that penetrates thoroughly the valves, such as *Melosira nummularia*, *M. arenaria*, &c. A drop of Canada balsam being then put on the glass slip, the cover is placed on it and the whole warmed over the lamp to evaporate the oil of lavender and partly harden the balsam. In order to show on the same slide the different views of the valves, Mr. Petit adds to those *in situ* a little portion of the gathering prepared in the ordinary way, viz., by boiling in acid. The preparations thus obtained are perfect and most interesting.—*J. Tempère.*

ZOOLOGY.

THE GUINEA PIG.—As I find that no work on Natural History I have consulted gives the correct period of gestation in the guinea pig, I think it might be interesting for me to record my observations. Eighteen instances I have carefully watched, and I find, without any exception, that the time is sixty-six days. As the guinea pig breeds again on the same day that it brings forth its young, and also, as I can testify, at the early age of eighty days, this no doubt accounts for the reason why a less time for gestation has been recorded in works on Natural History than is the fact. In no instance have there been more than four at a birth.—*Frederick Gull.*

BUTTERFLIES AND COLOURED NETS.—At Mentone, in 1878, I was at first utterly unable to catch any specimens of the beautiful Cleopatra butterfly. I had a light net with a blue tarlatan bag and each time I missed a specimen, it flew away to a great distance. It was also very rarely that one came within reach of my net. On mentioning this to a friend, he told me he found them very easy to catch, as they seemed to follow his net, the bag of which was green. Upon hearing this, I adapted a green bag to my insect net, and found it was only necessary to wave it backwards and forwards, when one or more Cleopatras would be sure to come and try and settle on it, and were easily captured. After I had thus procured plenty of specimens, I was one day hunting for the beautiful *Anthocharis Eupheno* when a Cleopatra fluttered after my net and could not be got rid of. And yet this was in a hot lemon plantation, with the green leaves of the lemon trees above and below. Again when driving from Salerno to Palestrina last spring, I had my net with the green bag. I saw a Cleopatra flying towards the carriage, and on waving my net behind, it followed for some distance. Mr. W. S. Coleman states that *Gonepteryx*

Rhamni and Cleopatra have been proved identical, since both have been reared from the same batch of eggs. The female Cleopatra does not differ visibly from *G. Rhamni* and was not attracted by green. This insect has often been labelled as a distinct species, *Gonepteryx Cleopatra*, and at the museum at Florence was labelled "*Colias Cleopatra*," while the ordinary brimstone butterfly was labelled *Gonepteryx Rhamni*, thus erroneously putting two varieties of the same species into separate genera! The male only differs from our British variety in having the fore wings nearly entirely suffused with bright orange colour instead of its being limited to a spot the size of a pin's head. Naturally therefore, as soon as possible, I tried waving my green net in a field full of the ordinary Rhamni, but none of them took any notice of it. Sometimes, when one settled, I waved my net close to it, but it either remained where it was, or else invariably flew right away. Why one variety of a butterfly is attracted by green, and the other with which it is identical should pass it by unheeded, seems to me wholly incomprehensible. It would however be highly interesting if any of the readers of SCIENCE-GOSSIP who had the opportunity were to try whether this beautiful variety is attracted by any other colour (say yellow), or to notice whether any other insects are attracted by certain colours in a similar manner.—*G. H. Bryan.*

THE FAUNA AND FLORA OF THE CUCKMERE DISTRICT.—Mr. F. C. S. Roper's last paper read at the Eastbourne Natural History Society was a very important one, dealing with the additions to the Fauna and Flora of the above district during the past year.

"THE FAUNA OF NORFOLK."—This well-known book, written thirty years ago by the Rev. Richard Lubbock, M.A., now appears as a new edition published by Jarrold & Co.: London and Norwich. In addition to the intrinsic merits of the book, of which we can personally speak in the superlative degree as one of the most pleasantly written of the many pleasant natural history books our language is so rich in, describing as it does the "Broad District"—a country unlike any other part of England, and a very paradise to the botanist, entomologist, and ornithologist—this new edition is edited by Mr. Thomas Southwell, the active secretary of the Norfolk and Norwich Naturalists' Society, whose full and accurate knowledge of the natural history of Norfolk better fits him for the task than any other man we know of. The memoir of Mr. Lubbock is written by Henry Stevenson, F.L.S., author of the "Birds of Norfolk," and Professor Alfred Newton contributes an appendix on Hawking in Norfolk, &c. Many other naturalists, such as Mr. J. H. Gurney, Mr. C. G. Barrett, Dr. Lowe, of Lynn, Mr. H. D. Geldart, &c., have also contributed notes or other assistance. We are glad to see an old and valued friend appearing in such good company.

BOTANY.

THE TOURIST'S FLORA.—In the September number of SCIENCE-GOSSIP, Bernard Hobson, in his enumeration of choice books on Botany, mentions the "Tourist's Flora," by Joseph Woods, F.A.S., F.L.S., F.G.S. It is stated to be a descriptive catalogue of the flowering plants and ferns of the British Islands, France, Germany, Switzerland, Italy, and the Italian Islands. Reeve, Benham, & Reeve, 1850. This book, until I ceased taking my annual botanical excursions abroad, was for twenty years my constant companion in the middle and south of Europe; it was most useful, as containing a brief, plain, and concise description of all plants within the limits above mentioned. In his introduction, the author says the work has no pretensions to originality, but gives a description from the works of different botanists, making it clear and distinctive, and at the same time, condensing the whole as much as possible, so as to be comprised in a single volume, of a bulk not inconvenient for the use of the travellers. The first eighty-two pages give the genera according to the Linnean System. He says the characters of the natural order are so little definite, that it is almost impossible for the student to determine a plant by them. He has therefore thought it best to give a *clavis analytica* of the Linnean system, and follow it in the arrangement of the genera by giving a reference to the species in the arrangement of the natural orders (containing 434 pages) with a copious index. The work is not elementary, but to a travelling tourist who has made some proficiency in botany, will be found of the greatest assistance, and quite portable. The book is, I understand, out of print; but I am assured that, from the numerous applications, a new and improved edition would meet with a ready sale to the constantly increasing number of English travelling botanists; and especially if the authors' names were added. The two systems being comprised in the same work, will enable the reader to select the one he finds most convenient in finding the genera and species.—*T. B. W., Brighton.*

DAUCUS CAROTA.—As a geologist, I am rather out of my element in botany, and hesitate to express an opinion upon the latter subject; but to those who, like myself, are but beginners, are not the descriptions which we find of the above-named plant in elementary books of botany, somewhat misleading? According to every book which I have yet seen, we are taught to consider the central red floret a reliable distinction. Yet surely this is not the case. Not only do the red petals often early drop off—but often no red florets are to be found on the plant when perfect. I have compared a good many specimens lately. Once, having pulled up a well-charactered specimen, I turned it upside down to examine the root, and on

replacing it in a natural position *all* the red florets, three in number, were gone. Other specimens, differing in nothing else but the central floret, had a single large white floret, in the centre of the side of the outer florets of the outer umbels. Others had single florets of every shade of pale pink, even so pale as scarcely to be distinguished from white. Others had partial umbels in the centre with two, three, or even four *small white* florets. The roots of all had the same carrotty smell when bruised. The locality is sixteen miles from the sea, so that I could not have found *D. maritimus*. One half of these specimens were till lately supposed by myself and others to be wild parsnip or other umbellifers, from which they differ in growth, foliage, inflorescence, and habitat.—*W. Dornes.*

GEOLOGY.

A MUSEUM FOR STAFFORD.—We hope the day is not far distant when every town will have a museum of natural history. Mr. C. L. Wragge, of Cheadle, has just presented to the town of Stafford a fine collection of geological, ethnological, and natural history specimens, collected in various parts of the world, and we hope it will prove the nucleus for a good museum.

RHINOCEROS TICHORHINUS.—A specimen of the head of this extinct animal has just been placed in the St. Petersburg museum. It is well preserved, and still covered with patches of hair. It is part of an almost complete carcase which has been preserved in the frozen state, like that of the well-known mammoth, whose hair and eyeballs are in the same museum, and it comes from the banks of a tributary of the Yena.

"THE CARBONIFEROUS LIMESTONE and Cefn-y-Fedw sandstone of the country between Llanymynech and Minera, North Wales." Under this somewhat uncouth title, Mr. George H. Morton, F.G.S., the Hon. Sec. of the Geological Society of Liverpool, has written a capital monograph of the geology of the most interesting part of the lower carboniferous formation of North Wales. A good deal of the matter has already appeared in the proceedings of the Liverpool Geological Society, but it is very pleasant to be able to read the description in the present unbroken fashion. Mr. Morton has for years past made the district in question the scene of his summer rambles and investigations. This handsomely got-up little volume bears abundant marks of good work. It is illustrated by an excellent large photograph (as a frontispiece) of the outcrop of the carboniferous limestone of Craig-yr-Ogof, and two others of a smaller but full-page size, of the most important natural sections, as well as thirteen wood-cut illustrations of quarries and sections. We congratulate Mr. Morton on the excellent way in which he now presents his labours to the geological world. The work is published by David Bogue, 3 St. Martin's Place, London.

NOTES AND QUERIES.

INTELLIGENCE IN ANIMALS.—The following may, perhaps, be of interest, as affording another striking instance of intelligence in animals. Last autumn a friend of mine residing at Torrington, Devon, stored away in a cupboard under a flight of stairs two dozen strong glass bottles of "home brewed" ginger wine, laying the whole of them on their sides. A few weeks afterwards the family was alarmed, night after night, by hearing strange and unaccountable sounds after all had retired to rest. Long-forgotten stories of haunted houses began to obtrude themselves on the recollections of the inmates, and, the noises continuing, the whole family became seriously alarmed. At length the mystery was cleared up. One of the family, having to go to the cupboard in which had been placed the bottles, discovered that all the wine, with the exception of one bottle-full, had disappeared, the thieves having broken most of the bottles and left the fragments of the glass scattered about on the scene of the debauch. On closer examination, all the corks were found to be more or less gnawed, and a rat-hole was discovered at the back of the cupboard. A trap was at once set, and any doubts as to the thieves were soon removed by the capture of a large rat. How the animals could have broken the bottles, all of them being laid on their sides on the floor, remains a mystery. The only way seemingly to account for it is, that on discovering the contents of the bottles, the rats had the intelligence to roll one against another, until they succeeded in effecting their object.—*George M. Doe, Torrington.*

INTELLIGENCE IN MAN AND ANIMALS.—The question is not whether reason and instinct are one and the same thing; but whether the intelligence of animals is the same in kind, and differs only in degree from the intelligence of man. There is a very great difference between reason and instinct: reason is a faculty dependent on instruction and experience, and instinct a natural impulse independent of instruction and experience, and I am driven to the conclusion that reason, not only exists in animals, but instinct in man; in other words the same intelligence is common to both, the difference being merely one of degree. The mind of a child has been compared to a blank sheet of paper, and this is a fair comparison: but he who invented the simile failed to see traced in sympathetic ink upon the blank paper a beautiful design, and so when circumstances and those around trace upon it their design, the moist colouring serves to reveal the latent colours too, and the two designs become blended and inseparable: and thus it is often difficult or even impossible to say if a precise action is instinctive, or prompted by reason (i.e. is the result of instruction or experience); but once grant the existence of this latent tracing and instinct in man is a necessary corollary. The passion for drink need not be adduced. Are not genius and intuition nearly akin to instinct? Is not the boy poet, the child who draws as soon as it can hold a pencil, but examples of deep instinctive feeling? "Some men," says the writer of "Ecce Homo," "seem to attain truth by an intense stare," and he instances Carlyle as an illustration. The illustration becomes doubly instructive when Mill in his autobiography mentions the same thing, how Carlyle as a poet saw things instantly, while he (Mill) was obliged painfully to argue up to them. Instances plainly showing animals are endowed with reason are so common that I need not cite any, but I would ask those of your correspondents who disagree with my conclusions if they have never

seen a dog perplexed and cogitate for some time before acting? It affects the general question but little to cite isolated cases; animals may reason, though chicken peck up as soon as they are hatched, just as men reason, though as children they once sucked their mothers' breasts. Mr. H. D. Barclay talks about moral faculties and abstract reasoning as if he were comparing the intelligence of an average Englishman with the intelligence of a spaniel or water-hen. But the comparison must be a very different one, and one would have thought no comparison necessary had the difference been merely one of kind. The comparison must be made between the lowest type of savage man and the highest type of intelligent animal—between the savage, whose ideas are limited, whose language is unknown, whose moral faculties approve a meal of hot missionary, whose abstract reasoning contrives to calculate his four fingers and thumb, and the dog who rescues his master's child, or pines and sickens when his master dies. This subject is so closely linked with others which powerfully affect men's minds that it is difficult to approach it wholly free from prejudice. Many hold as a matter beyond dispute that the vital principle of animals is annihilated at death, and to admit reason in the brute seems to doom all existence to a like end. Again, the question affects and is affected by the doctrine of evolution, and how is it possible for those who think this doctrine sweeps God from the universe and kills all hope of a future life to judge the matter upon its bare merits? How few too possess that sympathy with animals which is necessary to read and understand the mute signs which express their feeling and thought!—*T. H. Powell.*

INSTINCT OR REASON.—It is not yet that the question whether instinct and reason differ in kind or in degree will be settled. C. B., in the September number of *SCIENCE-GOSSIP* says very rightly that the words instinct and reason should be defined before we can discuss the matter justly. But here we are met on the threshold by lions in the path, for if we could agree on the true definitions of the terms there would almost be an end of the whole matter. Dr. Keegan's definition of instinct as a blind adaptation of means to ends, and reason as a conscious adaptation of means to ends, is as good as many, though far from accurately marking the distinction which some endeavour to prove. Such a definition of instinct would mark no line between the animal and vegetable world, for in the latter means are adapted to ends in a thousand varying contrivances. For the old view of instinct perhaps Paley's definition is as good as any. "An instinct is a propensity prior to experience and independent of instruction." And Julius Caesar Scaliger, in his mordacious criticism on poor Cardan calls instinct "impetus sine electione," and says, "Bruta non dicuntur velle, sed instigare: unde instinctus dicitur a natura: sicut a Diis afflato apud M. Tullium." (*Exercitatio cccvii.*) These old-world definitions are certainly not in accordance with facts, if we admit that—as quoted from Mr. Darwin in my letter in July *SCIENCE-GOSSIP*—"Animals may constantly be seen to pause, deliberate, and resolve," until this can be disproved I think it may safely and surely be said that instinct and reason are degrees in development of one faculty, and shade off imperceptibly the one into the other. I should not say that, "thin partitions do their bounds divide," but rather that any chart which includes one must perforce include the other. To what purpose is it that Dr. Keegan tells of mistakes made by beavers? If the blind impulse of the castor drives him into an occasional error, may we not share with him the

fallibility which centuries of vaunted reasoning have not expelled from our prouder race? The very fact that animals make mistakes sometimes shows how needful it is that their impulse or instinct should be guided by intelligence or reason, by the experience of life, the instruction and example of their elders, and, perhaps, "inherited memory." Day by day we are laughing at the frailties, the errors, the weaknesses of others, and let us hope, at our own; shall we then exult that a beaver misplaces his dam? The association of ideas, on which so much stress is laid by C. B., is the starting-point of our reasoning processes, but up and down the animal world we find the relation to that starting-point very various, some animals, including some men, having come short of it, while many animals have passed beyond, or, as most leading naturalists would maintain, the highest efforts of the brutes have done so. It is interesting to note that in Webster's Dictionary the word *instinct* is explained as, "the natural unreasoning impulse in an animal, by which it is guided to the performance of any action without thought of improvement in the method,"—while reason is said to be "the faculty or capacity of the human mind by which it is distinguished from the inferior animals." It is needless, after the numerous instances and the wide range of facts on record, to insist that animals perform many actions which cannot be attributed to an unreasoning impulse. No one can touch these questions without using the great name of Darwin, and it did occur to me that in quoting his statement, that "only a few persons now dispute that animals possess some power of reasoning," that opinion would have some weight. It was therefore with a comical feeling of injured innocence that I find Mr. H. D. Barclay stating that "The Darwinian hypothesis is not only unsupported by facts, but it is in flagrant contradiction to them"—and to support this marvellous *ipse dixit* adducing one or two well-worn objections, the value of which is well known. It is to be hoped that Mr. Barclay does not wish to emulate the Edinburgh reviewer who came forth to crush the fallacies of evolution, and who has met with such condign punishment in the "Fortnightly Review" of October. We are told that, as far as can be judged, brutes possess no power, of abstract thought, imagination, introspection, nor any moral sense: but will any one who owns an intelligent dog, or who has read the recent correspondence in "Nature," to say nothing of any elementary work of Natural History, admit this? The passage concerning the spider in my note in the July number of SCIENCE-GOSSIP was, as there stated, quoted from Professor Max Müller, who himself drew the illustration from Flourens' "De la Raison"; my contention would be that the spider when he finds his web broken considers whether he shall repair it, or start afresh—and that he exercises judgment and reflection in coming to a decision. To whatever branch of natural science we turn we find nearly all the leading men evolutionists: as Sir John Lubbock has said, "the doctrine of evolution, in some form or other, is accepted by most, if not by all, the greatest naturalists of Europe." And Dr. Allen Thomson, who has followed the secret of life unto its inmost recesses, said in his presidential address to the British Association in 1877: "I consider it impossible for any one to be a faithful student of embryology, in the present state of science, without at the same time becoming an evolutionist." I am far from saying, any more than Mr. Darwin himself, that the whole theory of evolution is complete and finally established; it is enough to know that the most competent students have facts and to spare in support of that theory. But I arrest myself in so ludicrous an endeavour as that of

supporting the doctrine of evolution. One point more. Mr. Gilliard suggests that "the power of arranging facts, drawing deductions from them, and acting from those deductions, uninfluenced by the impelling force of instinct," result from reason, and that this kind of reason is only possible in man. Without stopping to criticise the terminology, and admitting that the suggestion has a limited application, is it not obvious that in the millenniums during which the human race has educated itself, mainly through the power of speech, its advance beyond the brute world is not to be wondered at? Among all the causes of melancholy, Aerial Divels, Fiery Divels, Love, or any other in the black list of Burton's *Anatomic*, perhaps the one most calculated to depress a philosophic thinker is the slow progress of the human race to the goal of perfection prophesied for it by Mr. Herbert Spencer and other hopeful spirits. —James Hooper, Denmark Hill, S.E.

INSTINCT AND INTELLIGENCE IN ANIMALS.—All evidence seems to indicate that instinct and intelligence are not two distinct forms or modes of mentality, but a lower and higher development of one and the same form or mode. Many instances have been given in the pages of this journal and elsewhere of instinct which has, under peculiar circumstances, diverged into intelligent reasoning, and it is well known that many of man's thoughts and actions, which at some time or other have needed the exercise of distinct and appreciable mental energy, tend by continuance and habit to develop into illustrations of unconscious cerebration; and this phase of intellectual activity appears to be in many respects the counterpart of instinct in the lower animals. A man who desires to reach a certain spot, commences to walk thereto, but does not consider the disposition of the members necessary for this action, although, in the early period of his life, it cost him considerable trouble and practice to acquire this muscular harmony, of which now he takes no heed. So on the part of birds building their nests, or migrating by reason of instinct, or untaught ability, or, better still, hereditary, as distinct from acquired ability, have a motive. They feel a want, and unconsciously know how to supply it, performing all that is necessary without a consciousness or consideration of their actions. Further, there must of necessity exist certain primordial structures of an instinctive or intuitive kind, upon which all that a man is as a rational or intelligent being must be built. The difference between these primordial structures and the instinct of the lower animals appears to be that the former is capable of great development, while the latter, from the circumstances of the animal, needs no higher development, and therefore receives none. The calf, directly it is dropped, uses its legs and walks, and never finds any other use for them. The child is some time after birth before it exercises its similar germ of volition, and masters the art of walking, but subsequently it carries this to a much higher development, and learns to use its legs in a variety of ways, saltatory, gymnastic, and otherwise. Yet, though the one walks instinctively, and the other by intelligent effort, they have a similar volitional germ, and when the human being comes in time to walk, all unconscious of his effort, "*nescio quod meditans nugatur, et totus in illis*," there does not appear to be much difference between. This view would indicate that instinct and intelligence are identical in form, though not in degree; and that animals being allowed to possess instinct, may, without any strain of the recognised facts of mental science, be also allowed the possession of intelligence. —F. H. Habben, B.A.

INTELLIGENCE IN ANIMALS.—A friend of mine has a dog which is accustomed to run about loose. One day my friend wished to drive out, and did not wish to take the dog, and said so when the dog was by her. She then ordered it to be tied up. Soon after the dog disappeared, and when she was going to start, was nowhere to be found. My friend then started, but had not driven far before the dog appeared from the side of the road, and followed the carriage to the town. It then went away, not following the carriage to the stables, where it was left; but when my friend was walking about the town, the dog came to her and followed her till she returned. My friend has also a terrier which is accustomed to roam about, it is fond of going out through a gate at the end of the garden. This gate always makes a rattling noise when the dog gets through. But when this dog has been doing anything which it has been forbidden to do, instead of coming through the gate and to the front door, the dog creeps through some bushes and goes to the kitchen window. This dog is so fond of fruit that it pulls down the branches of the raspberries and eats of the fruit.—*M. Fordham.*

ANECDOTE OF A PARROT.—Mr. R. Bowdler Sharpe in his description of the parrots, gives a capital anecdote of one of these birds, which may be interesting to those readers of SCIENCE-GOSSIP who are not acquainted with it. Mr. Sharpe says, just as the monkeys have been placed at the head of the Mammalia, on account of their high development, so the parrots from their general cleverness, and especially on account of the facility with which they can talk, have been considered the highest order of birds, and placed at the beginning of the class. It is impossible for some people to avoid the conclusion that these birds think and reason, and the *à propos* or sometimes *mal à propos* way in which they introduce speeches, coupled with the look of wisdom which they assume while being spoken to, seems to show that the brain is being employed in thinking. A friend in Manchester told the writer of a parrot-show in the north of England, where the talking powers of each bird were made the subject of a prize competition. Several of the birds had exhibited their powers, and at last the cover was removed from the cage of a grey parrot, who at once exclaimed on seeing the company to which he was suddenly introduced, "By jove! what a lot of parrots!" an observation which gained him the prize at once. Instances of famous talking birds might be multiplied by the hundred, leaving no doubt on some minds that these birds often possess the power of reason of a very high order. Perhaps I may be allowed to record my opinion in reference to the discussion now going on in SCIENCE-GOSSIP on the intelligence of man and animals (certainly not an appropriate heading since both are animals), that there is no animal in existence, or that ever did exist, which is not endowed with reason either less or more just in accordance with the development of its brain.—*Dipton Burn.*

MICROSCOPICAL ANALYSIS.—Will any of your readers kindly inform me how to proceed in making a microscopical examination for analysis of compound cakes made from materials such as South African ground nuts, palm nut kernels, cocoa nuts, and the meals of same, in order to test their constituent qualities? Or, is there any treatise on the subject published which you can recommend me to refer to in carrying out such examination?—*Lynn.*

GORDIUS AQUATICUS.—An intelligent neighbour who often consults me on doubtful points of natural history writes me thus the folk-lore about it. "It is

popularly supposed that a hair of an entire horse falling into a pool of water becomes an eel. As you are conversant with these and kindred subjects, will you kindly say whether you recognise the statements to be in accordance with the teachings of science." Of course my reply was that the animal in question was never a horse-hair, and never could become an eel. I recognise this animal as my old acquaintance, *Gordius aquaticus*, which I used to see at Tallandsand, near Polperro, in a pool where the farm horses were accustomed to water: a brownish, rigid worm like a piece of vivified copper wire. The notion there also, was that it was originally a horse-hair dropped from the mane or tail of the horse while drinking, and becoming subsequently animated. These worms are occasionally found in herbage and puddles. I had heard it said that they inhabited the intestines of some insects, especially the grasshopper. Dr. Spencer Cobbold, our first authority on helminthology, kindly informs me that the Gordii become parasitic in insects, caterpillars, and infest fishes in their young state; also that the young of *G. aquaticus* are found in water beetles.—*T. Q. Couch, Bodmin.*

UNRIPENED FIGS.—The Rev. Z. J. Edwards has in his garden a fig-tree which bears fruit every year. When the figs are full grown they turn yellow, deluding us with the prospect of plenty of ripe figs, and drop off: at this moment the ground is covered with them. Can any of your readers help us as to the cause and tell us of a remedy? The tree is planted in a corner with a high wall on the south and east. But it is luxuriant in growth and looks healthy, the upper branches which are above the wall are in sunshine. The tree is about twenty years old.—*Misterton Vicarage, Crewkerne.*

ENTOMOLOGICAL NOTES FOR 1879.—The following notes, chiefly concerning common insects, may not prove uninteresting to some of your readers. In this district, during the past year, the small tortoise-shell butterfly (*V. urticae*) has been exceptionally numerous, a fact which has been mentioned to me, not only by those observant of natural objects, but by some who were quite ignorant of such things. The green-veined white has also been very abundant, and the small cabbage and large cabbage whites have been quite up to the average. The orange tip (*A. cardamines*) was very plentiful; indeed, I never saw it so abundant, and in such good condition before. From some unaccountable reason, the peacock (*V. Io*) appears to be disappearing altogether. Last year I only saw three or four specimens, and this year I have only heard of one being observed. One specimen only of the red admiral (*V. atalanta*) has come under my notice. The blues and the common copper have also been less frequent. Four specimens of the painted lady (*V. cardui*) have been observed; a rather unusual occurrence in this neighbourhood. None of them were captured. I have in my possession some specimens of this insect which were caught by my brother at some distance from the coast, in the English Channel. The common wasp has been very scarce, and the fishermen complain very much of the lack of grub. The common house-fly, and, indeed, all insect torments of the kind, have been much fewer than in late years.—*J. A. Weldon, Northallerton.*

SAGACITY OF THE MAGPIE.—Those who have never watched the magpie as a pet, would scarce give credence to the following. A portion of a copse had been cut, and some faggots stacked on the ground, under which, near the corner, a hen pheasant was sitting on her eggs; nothing is so sweet to a

magpie's tooth as an egg, but the pheasant had a strong beak and knew how to use it. But a pair of magpies who had a nest in the same copse were equal to the occasion. Mag No. 1 quickly took a position as near as possible to the nest, but just round the corner of the faggot stack, Mag No. 2 alighted in front and in full view of the pheasant, towards which he made noisy advances with distended wings and ruffled feathers backwards and forwards in mimic charges, until the exasperated bird left her nest to drive off the marauder, when in dashed Mag No. 1 and carried off an egg which they both retired to enjoy, returning again in the same manner for a second and a third, but a young pheasant being considered of more value than a young magpie, one was shot, and the other being unable single-handed to cope with the pheasant she brought off the remainder of her brood.—*G. T.*

POSTAGE OF PLANTS, &c., TO FOREIGN COUNTRIES.—Having occasion to send some specimens of dried mosses and ferns abroad, and thinking I could forward the same per book-post, I was much surprised on inquiry at our post office to find that the only way of transmitting them was per letter post. I wrote to the Postmaster General in London, stating the nature of the plants in question, asking if I could not send them by some cheaper plan. His reply was "Your inquiry is under consideration." After the lapse of nearly three weeks I am pleased to say I have received a further communication from him in which he says, "Specimens of dried plants and mosses may be sent by *sample* post to places abroad."—*Ben B. Scott.*

LOCAL DISTRIBUTION OF LAND SHELLS.—While staying a short time this year at Ilfracombe, Devon, I was considerably impressed by what appeared to me a rather remarkable instance of local distribution of *Helix nemoralis* and its variety *H. hortensis*. On the western cliffs and about the Tors walks *Helix nemoralis* occurred in great abundance, although I failed to find one single specimen of *H. hortensis*. But, on the eastern side of the town, upon Hillsborough and the immediate neighbourhood, *Hortensis* was in the ascendancy, and, although I did find one or two *Nemoralis*, they appeared to be the exception and not the rule. As far as I could see the physical conditions of the two districts were the same. Perhaps this or similar instances have been noticed by others.—*John L. Hawkins, jun., Reading.*

MORBID SENSATIONS.—Some time ago I went to see the snakes fed at the Zoological Gardens, a very interesting sight, which no lover of nature should miss. I do not, however, write to describe a scene the reader may witness for himself, but to remark on the strange behaviour of many of the spectators. "How horrid!" "How cruel!" "Come away!" "Don't look!" were the exclamations I heard around me, and many persons left the house. Apart from the inconsequence of the remarks of many of the spectators, it struck me forcibly as passing strange that men and women could not bear to witness the normal workings of nature, without a display of that morbid sensitiveness (so distinct from genuine feeling) which seems so prevalent in these days. It is a curious fact that persons afflicted with this moral malady are far from being the most humane in their conduct to their fellow-creatures and the brute creation.—*A Common Man.*

YEW POISONING.—I know of two Irish yews in a paddock close to a farm-house in my parish where horses, cows, calves and sheep are placed. The trees

are cropped as far as they could reach, and the farmer told me he never lost an animal. I doubt the alleged cases, as why should they not be poisoned in this particular instance?—*S. A. B., Allan, co. Tyrone.*

FLEAS ON MOLES.—Last June I had several freshly killed moles brought me, as I wanted their fleas. I put them in a bowl of cold water and waited for the fleas and acari to rise to the surface. I soon saw something large for a flea crawling on one of the moles, and at once secured it in a bottle. I mounted it with very little pressure; it certainly is a mole's flea but very dark, and it measures from the forehead to the end of the body quite $\frac{9}{10}$ inch, very nearly $\frac{1}{2}$. I have shown it to several microscopists and others, and no one I have met has ever seen a flea nearly so large. I have several fleas of a good size, but the largest measures by a micrometer only $\frac{1}{8}$ inch. The difference between $\frac{9}{10}$ and $\frac{1}{8}$ is no trifle. I should be glad to know whether fleas so much above the usual size are known.—*W. Locock, Clifton.*

PARASITES ON HEDGEHOGS.—In reply to your correspondent Singer Barclay, I should say few animals are more infested with parasites than hedgehogs; a flea, two species of ticks, and an acarus being found on them. The flea infests the whole body and may be seen running amongst the spines. The acarus only infests the under and hairy parts, while the ticks, often in company, may be found sticking to the hind legs and round the tail of an aged specimen, and are with difficulty removed without the loss of either head or lancets; it is rather rare to find both fleas and ticks on the same animal, and equally so to find one without any, so that I should infer that they were unable to clear themselves. I have never seen a hedgehog voluntarily take to the water, but it is instant death to immerse a tick.—*George Turvill.*

BEES v. KALMIA LATIFOLIA.—The following are some observations on the effects of the flowers of kalmia on bees: July 12th. During a brief paroxysm of sunshine, the kalmia was visited by (1) a blue-bottle fly; (2) a butterfly who retreated after a short flirtation; (3) a bee, who remained some time at work, and then crawling about languidly fell down to the ground. July 15th: (1) a bee who set to work steadily, but soon appeared to be stupefied and powerless, I removed her (him) to a pink, where she (or he) remained quietly a little while and then departed; (2) a bee; (3) a humble bee who after flirting with two or three flowers, departed, without alighting; (4) a bee who settled to work for some time, and became almost helpless, was removed to another flower and no more seen. July 18th: Several bees and a humble visited the kalmia, but without alighting. I put a bee into a flower, and after working there some time, found her making feeble efforts to get away. In gathering the bloom, for the purpose of closer inspection, I lost the bee, and so missed the opportunity. Query: Is there some intoxicating substance in the kalmia?

WITHOUT AN ORDER FOR ADMISSION.—Last year a death's head moth was picked up on a fine old oak staircase, erected at West Hampnett House, by Sir John Chapman, in 1617. This year, early in October, another specimen was taken in an adjoining room. No chloroform being immediately available, the peculiar shrill squeak, characteristic of *Acherontia Atropes*, was repeatedly heard. Within the Union House no special attraction was apparent; but, a few yards distant, half of the large garden

was, as usual, planted with potatoes. The past twelve months were sufficiently gloomy in every respect for a purely agricultural district sown with wide breadths of corn; and visitation by such "casuals" at the commencement of a period of great trial and depression, and again later, though it is to be feared not at the termination of it, might, in Eastern Europe, have been interpreted as an evil omen. Great average longevity of the pauper inmates has not, however, yet been perceptibly decreased by these heralds of the destroying angel. One resident stood for the militia drawing some eighty years since, and well remembers the bells of Alresford and the surrounding village churches being rung, night after night for a week, and then, occasionally, in commemoration of the great victory at the Nile in 1798; he continues hearty and well in spite of *Acherontia Atropos*.—*M. O.*

HISTORY OF THE APPLE-TREE.—Having seen myself quoted in a recent article "On the Apple-tree" in your magazine, as "the late Mrs. Bayle-Bernard," allow me to ask you to contradict the statement implied, since I do not wish the world to be told that I have quitted it while it is still in my power to be, yours, &c.—*E. G. Bayle-Bernard, Author of "Our Common Fruits."*

HARVEST MICE REARED IN CAPTIVITY.—A month ago, a mouse of this species was brought to me, which I considered would shortly become a mother. Knowing full well that to turn her into the large cage with my other harvest mice would mean death to her progeny, she was placed in a cage by herself, with a good nest of dry grass and straw. The same night she gave birth to some young ones—how many was not discovered till they emerged into public life. The next morning (waiting, of course, till the mother was out of the nest in the playground), I parted the straw—already gnawed into shreds and woven into a covering—with a new pen, as being an implement not likely to have any smell about it that might rouse her anger, in order to ascertain whether, in consequence of her recent captivity and solicitude for her offspring, she had become an infanticide. This contingency was the more probable, because she had been roughly handled by the boy who caught her. However, there were some pink specks down at the bottom of the nest, moving slightly. Then I at once shaded the cage entirely with a cloth, which was only removed for a few moments, once every day, when a fresh supply of food, consisting of bread and butter, meat, flies, wheat, &c., and clean water, was placed in the playground—on which occasions I took a hasty peep at the nest to see that all was going on well. When thirteen days old, the young mice, three in number, and about the size of a cockchafer, first popped their heads out of the nest, anxious to test the strength of their incisors on anything they could find to nibble at, and exercise their delicate prehensile tails. They were then of a dull brown above, and dusky white beneath; and though now three parts grown, have not yet assumed the red colour peculiar to the upper parts of adult harvest mice, the stomach and thighs of which are pure white. It is worthy of record that through all their thirteen days of babyhood, the youngsters, though close at hand in my study, were not once heard to squeak. This is the first time with which I am acquainted, that the young of the harvest mouse—the smallest mammal in England, and probably in the world—have been reared in captivity.—*A. H. Malan, M.A., Ferran-Arworthall.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish *SCIENCE-GOSSIP* a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

W. G. DAISH.—The object you enclosed is a fungus called *Clavaria fusiformis*.

A. J. CHAMBERLIN.—The objects on the leaves are commonly called "oak-spangles." They are galls, formed by a species of Cynips. For an account of them, see Taylor's "Half-hours in the Green Lanes," page 197.

W. J. COLEBROOK.—It is not very common to find lilac leaves growing in malformed pairs like those you sent us, and we are much obliged to you for them. You can join the Quckett Club without living in London. Write to the secretary for rules, &c., enclosing stamped and addressed envelope for reply.

J. A. BATHER.—The following are excellent works on blowpipe analysis of minerals:—"Determination of Minerals by the Blowpipe," by Dr. C. W. C. Fuchs (translated by T. W. Danby, F.G.S.), price 5s., London: Field & Tuer, 50 Leadenhall Street; and "Blowpipe Analysis," by J. Landauer, price 4s. 6d., London: Macmillan.

O. P. CAMBRIDGE.—The pretty diminutive red fungus is *Phyrium rubiginosum*.

G. T. HARRIS.—There are some scholarships in botany, we believe, in connection with the London hospitals. We do not think the Science and Art Department can open out to you any office. The "Journal of Botany," price 1s. 3d., is a monthly serial devoted to botany, published by West, Newman, & Co., 54 Hatten Garden, London.

E. E. EDWARDS.—The following are good books on British zoology:—Yarrell's "Fishes," Couch's "Fishes," Yarrell's "British Birds," Bell's "British Quadrupeds," Forbes' "British Starfishes," Gwyn Jeffreys' "British Conchology" (5 vols.), Gosse's "Marine Zoology" (2 vols.), Bell's "Stalk-eyed Crustacea." As to the rest, Carpenter's "Animal Physiology," Huxley and Martin's "Physiology," Flower's "Osteology," &c.

MISS E. C. (Woburn).—The specimens sent go by the name of "artichoke galls," on account of their resemblance to those vegetables. They are caused by a species of Cynips piercing the young leaf-buds of the oak, so that they develop abnormally fast, and assume the artichoke shape.

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"Illustrations of the British Flora: a Series of Wood Engravings, with Dissections of British Plants." By W. H. Fitch, F.L.S., and W. G. Smith, F.L.S. London: L. Reeve & Co.

"Bulletin of the U. S. Geological Survey," vol. v. No. 1.

"Les Mondes."

"Le Monde de la Science et de l'Industrie," No. 10.

"Extinct Species of Rhinocerotidae of North America," &c.

By E. D. Cope.

"Notes on the Flora of Surrey." By A. Bennett.

"Journal of Forestry," October.

"Feuille des Jeunes Naturalistes," November.

"Annual Report of the West London Scientific Association."

"Transactions of the Watford Natural History Society."

"Proceedings of the Norwich Geological Society."

"Lectures on the Geology of Leighton Buzzard and its Neighbourhood." By E. W. Lewis, F.R.G.S.

"Proceedings of the Liverpool Geological Society."

"The Insect Fauna of the Mesozoic Period," No. 2. By H. Goss, F.L.S.

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